# The Chemical Age

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# Notes and Comments

## Institute of Chemistry Jubilee

THE chemical profession has its own special interest in this year's jubilee festivities, inasmuch as the Institute of Chemistry will, shortly after the national commemoration of the twenty-fifth anniversary of the King's accession to the throne, be celebrating its own charter jubilee, the royal charter of incorporation having been granted to the Institute on June 13, 1885. His Majesty has been graciously pleased to confer his patronage on the Institute and the celebrations will take place in July. Actually the Institute has been in existence for nearly sixty years, the 57th annual meeting having been held in London last week, when Professor Jocelyn F. Thorpe was re-elected president. The Institute enters its jubilee year with a total membership of 6,285 and a total of 783 registered students.

Many distinguished guests will be invited to an official banquet on July 9, and on the following day there will be a reception, dance and cabaret in which members of other societies and institutions will be invited to participate. It is hoped that the hon. secretaries of the local sections will be able to hold their annual conference in London about the same time. After the London celebrations, the local sections will probably make their own special arrangements for marking the occasion, and the Institute will assist them in regard to the entertainment of prominent guests.

## Chemical Engineering Congress, 1936

CONSIDERABLE progress has been made by those concerned with the organisation of the Chemical Engineering Congress of the World Power Conference, to be held under the auspices of the international executive council from June 23 to 27, 1936, at the Central Hall, Westminster. For several years the desirability of holding an international congress of chemical engineering has been realised by those interested, and it is largely due to the initiative of the late Sir Frederic Nathan that definite action has at last been taken. The decision having been made to hold the congress, the problem of carrying it into effect was happily solved by the generous and ready co-operation of the international executive council of the World Power Conference. Much duplication has thus been avoided, without in any way impairing the autonomy of the chemical engineering congress. The statesman-like policy of the council has placed the widespread organisation of the World Power Conference at the full disposal of the congress.

Chemical engineering has now definitely emerged as a distinct branch of the engineering profession, due in no small degree to the striking developments in the provision of new materials, available both for manufacturing and constructional purposes. In addition to his connection with the chemical industry itself, there is practically no branch of industry in which the chemical engineer does not, or might not, contribute valuable assistance. The field of activity of the chemical engineer is indeed so wide that close co-operation with other branches of the chemical and engineering professions may be necessary in many problems of major importance, and the realisation of this should form part of his education. The organising committee of the congress will be presided over by Sir David Milne-Watson, with Dr. E. W. Smith as vice-chairman. The congress will be under the patronage of the Duke of Kent, with Mr. Stanley Baldwin as honorary president, Lord Leverhulme as president, and representatives of all the principal chemical and allied organisations as members of the grand council. Mr. W. A. S. Calder is chairman of the technical committee, Mr. J. Davidson Pratt is chairman of the finance committee, Sir Alexander Gibb is in charge of hospitality, and Dr. E. W. Smith will handle the publicity, while Mr. M. W. Burt, of the British Road Tar Association, has been appointed general secretary.

## Scope of the Congress

THE technical programme promises to cover a very wide field of chemical engineering activity. It is divided into six sections, embracing chemical engineering projects; plant construction; fuel, heat and general problems in chemical engineering; administration and works organisation; trend of development and general aspects. The section dealing with fuel, heat and general problems will include the selection and application of fuel and power, carbonisation, distillation, evaporation, condensation, crystallisation, treatment of gases, hydrogenation, cracking and other high pressure developments, heat exchange and heat transference, lubricants and lubrication, preparation of materials and the disposal of solid, liquid and gaseous effluents. The much debated question of the education and training of the chemical engineer will come within the purview of the section dealing with administration, which will also discuss scientific and technical control, costing and the use of statistics and safety and welfare problems. General aspects embrace experiences in the translation of semi-scale processes into industrial production, modern developments in pure science and their significance in industry and the functions of national and private research establishments in connection with chemical engineering. It is particularly desired that

each paper presented, while adhering strictly to chemical engineering, should deal as fully as possible with the economic aspect of the subject.

After the congress the papers, together with the discussions, will be published by the committee in two or more volumes, which will be uniform with the transactions of previous meetings of the World Power Conference. It is intended to confine the contributions to comprehensive papers submitted by representative and authoritative bodies in each participating country through the national committee concerned. There will be a general reporter for each section, and the general reporters will prepare reviews of the papers submitted under each heading of the congress programme, and will direct the attention of the meeting to those aspects of the subject to which it is felt discussion could be most usefully directed. Full particulars of the congress will be issued by the organising committee in due course. In the meantime all communications should be addressed to the congress office at 56 Victoria Street, London, S.W.1.

## Exhibition of Chemical Plant

THE British Chemical Plant Manufacturers' Association will hold its periodical exhibition of British chemical plant at the Central Hall during the course of the chemical engineering congress. The Association has issued a letter to all chemical plant makers with whom it is acquainted, drawing attention to the contemplated exhibition and recalling the successful exhibition held at the same place in 1931 on the occasion of the jubilee celebrations of the Society of Chemical Industry. The object of the Association's letter is to serve as a preliminary announcement and to ascertain which firms are likely to be interested in the exhibition, in order that the Association may know to whom to send particulars at a later stage when further details are available.

The following preliminary information is given: The exhibition will be held from June 22 to 27, 1936, on the ground floor and basement of the Central Hall, Westminster. The hall will be available four days before the exhibition and three days after the exhibition for the installation and removal of stands and exhibits respectively. Approximately 20,000 sq. ft. of exhibiting area are available. The cost of the space is not yet finally settled, but is not likely to exceed 4s. per sq. ft. for space only. Members of the British Chemical Plant Manufacturers' Association will receive a preferential discount of about 10-20 per cent., and will also be given certain preferences in connection with the allocation of sites. Applications will be dealt with strictly in rotation, members of the Association being given preference up to a certain date, which will be fixed later. All sites will be allotted from a definite plan. Readers who have not received a copy of the Association's letter and are interested as potential exhibitors, should communicate with the Association at 166 Piccadilly, London, W.1.

## Industrial Secrets

THERE are few subjects which have a greater interest to us than that of industrial secrecy—the abandonment of that policy of the aged and decrepit which believes that the way to industrial success is the possession of manufacturing secrets. That is an outworn Victorianism which could only flourish in days when men were ignorant; under present conditions it is not only a foolish attitude but one that is positively dangerous. The man who lives by his secrets is like the ostrich with his head in the sand. Neither can see what is going on around them; both imagine that the world is standing still—until they are caught. Research is a powerful weapon—and is dangerous in the hands of one's competitors unless it is countered by equal knowledge and research. At the annual banquet of the Ceramic Society, the speeches upon this occasion being lately published in the Proceedings, we were interested to notice an example of this attitude given by Major Freeth. In years gone by, long before the formation of Imperial Chemical Industries, Ltd., " there was a company called Nobel's Explosive Company, which was an amalgamation of explosive companies; and all these people were extremely ' hush-hush.' Everybody seemed to be nursing a tremendous secret which they took great pains to keep from everybody else; but when we got them all together we found that nearly everyone was nursing a terrific ' secret '—which everyone else already knew." Major Freeth suggested that the best way to get together was by a "one-to-one individualism," in which competitors became friends and discussed their mutual problems.

Our own experience shows that it is quite feasible for firms to be competitors in one line of business, "fighting" each other for every order, and in another similar line to work in close co-operation. Those who manufacture chemicals frequently find themselves selling through the same organisation, as for example sulphate of ammonia, road tar, benzol and so forth; in this instance co-operation is even more readily achieved. Even when manufacturers are competing in the same market, it is better for them to take advantage of each other's discoveries rather than to have to repeat each other's work and to keep passing and repassing each other in the industrial race at a cost of effort that is too frequently to be described as "the pace that kills." Research is the life-blood of the chemical industry, but it is better to be conducted in collaboration than in competition. There is no question that each industry is tending to become a national unit rather than a warring collection of individualities.

## Increasing Collaboration

FORTUNATELY the campaign against secrecy has done some good already, and collaboration is being affected to an increasing extent. Dr. E. F. Armstrong writes in the handbook of the British Standards Institution that the full support of individual firms has been willingly given: "it is gratifying to record the readiness of those organisations which have been doing pioneer work in the field of standardisation to place the results at teh disposal of the Institution." Again drawing upon long industrial experience, we can quote the example of more than one of the major industries of the country that a few decades ago were utterly unscientific and anything but ornaments to British industry, but that to-day as the result of interchange of ideas between the works managers and technical staffs are now among the best managed and most scientific in the country. The former competitiveness of one firm with another has not changed, but have advanced together with the result that the post-war storms have been weathered and the international competitive position is infinitely greater than it could have been if that collaboration and free interchange of ideas had not taken place.

# Annual Meeting of The Institute of Chemistry

## Professor Jocelyn F. Thorpe Re-elected President

**Professor Jocelyn F. Thorpe, President of the Institute of Chemistry.**

THE fifty-seventh annual meeting of the Institute of Chemistry was held in the hall of the Institute, Russell Square, London, on March 1, under the presidency of Professor Jocelyn F. Thorpe, who was re-elected president for the year 1935-36. The council's annual report recorded a total register of 6,285 members and 783 registered students. During the year the council had elected 66 Fellows, of whom 59 were formerly Associates, and 274 Associates, of whom 97 were registered students, and four Associates had been re-elected. New students admitted numbered 241. The council recorded the death of 39 Fellows, 14 Associates and one student.

The report stated that the legal and parliamentary committee had been concerned with matters relating to the Patents and Designs Act, 1907, particularly a Bill introduced in the House of Commons last June to amend the law relating to patents and designs by providing for the protection of employee inventors. The council came to the conclusion that the Bill as presented was not in the best interests of inventors or of the progress of science. Attention had also been directed to the New Arbitration Act, 1934, which came into operation on January 1, 1935. The provisional Poisons List and Poisons Rules, prepared by the Poisons Board appointed under the 1933 Act, were brought to the notice of the council, whose observations were invited on several of the rules, particularly that specifying persons who should be entrusted with the preparation of poisons intended for internal use in medicine. Representatives of the Institute were appointed to meet representatives of the Association of British Chemical Manufacturers to confer on this and other matters, and the views of the council were subsequently transmitted to the Poisons Board.

### The Year's Activities

Representations had been made by the public appointments committee to a number of municipal authorities regarding the terms of appointment of public analysts and to the Colonial Office regarding the conditions attaching to certain appointments of chemists in the Colonial Service. The draft of the fourth report of the Fertilisers and Feeding Stuffs Advisory Committee was referred to the Institute for observations. Copies were circulated among members of the public appointments committee and other Fellows having special knowledge of the subjects referred to, and their opinions were forwarded to the standing advisory committee.

Correspondence passed between the Association of Public Analysts for Scotland and the Institute, regarding the representations which the Association had made to the Scottish Milk Marketing Board, with reference to butter-fat testing under the scheme introduced by the Board. In previous correspondence between the Institute and the Ministry of Agriculture, the Ministry had agreed that official analysts might be regarded as suitable authorities for the testing of milk samples under the scheme, and promised to consider the question of their inclusion in the regulations. The Association, not being satisfied with the reply received from the Milk Marketing Board, is pursuing the matter.

Professor THORPE, in moving the adoption of the report, said that the council had considered many matters of importance, including the place of chemistry and science in pre-university education, on which there was a difference of opinion as to whether biology should be introduced into the school curriculum, possibly at the expense of time previously devoted to chemistry. The Institute was in a strong position financially, and had co-operated with many other organisations in matters of public importance during the year. Negotiations were on foot for closer co-operation with other societies devoted to chemistry, particularly the Chemical Society and the Society of Chemical Industry. A remarkable list of valuable papers had been read before the eighteen local sections of the Institute at home and in overseas Dominions, and the number of candidates for the examinations for the membership of the Institute had increased.

Continuing, the president dealt with the importance of individualism in professional scientific life. Having regard to the bearing of the subject on the development of team work in research, he emphasised especially the desirability of giving due credit to the individual worker who initiated and developed ideas and produced results. He recalled that team work as a method of attack had been applied with full success during the middle part of the nineteenth century, in the great chemical schools which had been created in the German universities by such men as Bunsen, Baeyer, Victor Meyer, and others, and that later its chief exponent in this country was the younger W. H. Perkin, who created the Manchester School of Organic Chemistry, a research organisation equal to anything of the kind on the Continent. That, however, was not quite the same team work as they understood the term to-day.

### Expression of Individualism

The heads of those schools were great chemists, men of wide interests and broad outlook, whose work covered a variety of different fields and allowed scope for the expression of individualism. The men who possessed this quality became quickly separated from those without it, and ultimately became leaders themselves. It seemed to him that individualism could not be instilled, but, in those who had it, could be encouraged and developed. He contrasted the present condition for research work with those existing some forty years ago in the big German factories, where there was little or no intercourse between the members of the research section, who never seemed to talk to one another, and occupied their separate tables at lunch, being fearful less they would communicate to their fellow-workers something of the investigations on which they had been engaged, and thus lose the credit which was due to them. That was the competitive method which had now practically died out. He was not doubtful of the value of team work as a means of output, but rather of its effect on the individual as a unit. Did it kill individualism or prevent its development, and was it possible so to arrange matters that while retaining the value of the method as a means of co-ordinating output, the soul of the individual might not be destroyed thereby? Employers and directors of research should not forget the team workers. It was desirable that they should receive due acknowledgment for their work in the interests of industrial development generally, and also because they should be known, and thus be able to transfer their services to other work when circumstances rendered such a step necessary.

The president reminded the members that during the present year the Institute would celebrate the fiftieth anniversary of its incorporation under Royal Charter. His Majesty the

King had been graciously pleased to confer his patronage on the Institute, and the celebrations would take place in July.

The officers and council for the ensuing year were elected as follows:—President, Professor Jocelyn F. Thorpe; vice-presidents: Mr. W. J. A. Butterfield, Sir George C. Clayton, Dr. A. E. Dunstan, Mr. F. G. Edmed, Dr. H. H. Hodgson, and Mr. W. H. Roberts; hon. treasurer, Mr. P. H. Kirkaldy; members of council: F. S. Aumonier, C. O. Bannister, S. A. Brazier, W. A. S. Calder, T. Callan, F. D. Chattaway, G. R. Clemo, H. E. Cox, H. W. Cremer, W. M. Cumming, H. D. Elkington, G. D. Elsdon, J. Evans, A. E. Everest, L. Eynon, W. R. Hardwick, I. M. Heilbron, G. E. Holden, W. Honneyman, R. H. Hopkins, E. B. Hughes, J. C. King, L. H. Lampitt, A. G. G. Leonard, J. H. Lester, H. Levinstein, Dorothy Jordan Lloyd, J. Macleod, J. I. O. Masson, C. A. Mitchell, T. F. E. Rhead, R. Robinson, F. Southerden, A. Tait, E. Vanstone, W. Wardlaw, H. B. Watson, J. Weir and F. J. Wilson.

# The Costs of Steam Generation

## A Discussion by Members of the Institute of Fuel

A DISCUSSION concerning the costs of steam generation took place at a meeting of the North-western Section of the Institute of Fuel on February 26. The discussion was opened by Dr. E. S. Grumell and by Mr. Frank Smith, on behalf of Mr. Watson Smyth. Major F. Vivian Gloag, M.I.Chem.E., presided.

Dr. GRUMELL referred to the method of costing steam although he was not desirous of raising a discussion of the relative values of costing on a net or gross basis. He had ultimately decided to deal with the costing of steam on a net basis, namely, on the gross amount of steam generated less the steam used for auxiliaries. The net steam was the steam actually available for use.

For the sake of making comparisons readily, all steam was converted into a standard heat value. It was obviously unfair to compare the cost of generating 1,000 lb. of steam if the heat or average content of the steam differed according to pressure and temperature. For the purpose of comparison a conversion was made to a heat unit of 650 k. cals per kg. (1,170 B.Th.U. per lb.). The chief items in the cost of steam were fuel, water, services, process wages, repairs and maintenance, ash handling and removal, and, more recently, flue gas treatment, supervision, rates and obsolescence. Thermal efficiency, load factor and rated capacity had a direct bearing on these items. The modern method of working boilers at a high rate of evaporation per sq. ft. of installed heating surfaces reduces the capital cost and charges. Within certain limits, in a modern plant, the effect of rating on thermal efficiency was not pronounced. This had been described in the technical Press and no further reference was necessary to it.

### Thermal Efficiency

Consideration of thermal efficiency might be divided into two parts: (1) Inefficiency of operation and (2) design. The thermal efficiency of plant might be 5 per cent. or even 10 per cent. below what it ought to be through a low standard of supervision, faulty combustion or wrong choice of fuel. Otherwise, thermal efficiency depended in a modern boiler solely on the design and extent of the installed heating surface. The amount of heating surface to be installed and the relationship between boiler, economiser and air heating surface influenced the fuel costs and capital charges. Load factor was, of course, very important, and the plant with a steady 24-hour load, such as might be met with in the chemical industry, had a great advantage over the 8-hour factory or the peak load power station.

The present tendency to higher pressures and temperatures had undoubtedly increased overall thermal efficiency, but it must be remembered that there had been, and still was, in some quarters too much importance attached to overall efficiency and too little attention paid to cost. As a rule, "fuel" formed 75 per cent. of the cost of steam, and it was this aspect of the cost which he desired to emphasise.

Mr. FRANK SMITH agreed with Dr. Grumell that far too much importance was attached to the efficiency of a plant and too little to the steam costs. In the case of an industrial plant the production departments were not concerned with the efficiency of the boiler plant so much as with what it was costing for the steam they consumed. While the firm with which he was associated issued a weekly report on steam generated, coal consumed, etc., on the boilers, much more importance was attached to the report of steam consumed by various departments, together with the "steam cost sheet." The chief item in steam costs was "fuel," which was usually at least 50 per cent. of the total cost, and efforts were continually being made in industrial plants to reduce its consumption.

Mr. R. H. CLAYTON said that in the case of Lancashire boilers it was rather difficult to get a high percentage of $CO_2$ without incurring the danger of a smoke nuisance. If the waste heat was kept down to a very low point the essential $CO_2$ did not make very much difference.

Mr. A. STUBBS said that costing was an approximate science and was quite different from accounting which was an exact science. People usually referred to the cost of steam per 1,000 lb., but really what they had in the back of their minds was the cost of B.Th.U. Station efficiencies had nothing at all to do with the cost of the B.Th.U. The major item was the thermo-dynamic drop, which was an entirely different matter and involved not only the steam and the heat content in 1 lb. of steam, but also the condition of the steam and the energy available for doing work. High thermo-dynamic efficiencies which could be referred to of the order of 23 per cent., as compared with 12 per cent. some 10 years ago, had resulted generally from the use of higher pressures and higher temperatures. They had not resulted, or very little indeed, from matters of combustion efficiencies or boiler performance. The power engineer was interested in the combination of the B.Th.U. and the state of the steam. In order to cost properly it was necessary to find some combination of the cost of 1 lb. of steam corrected for the potential drop. This might involve some complex arrangement which took account of the fact that at higher pressures the unit drop was not necessarily of the same value as at the lower pressures. The unit drop for power purposes was probably cheapest round about atmospheric pressure. At Billingham, steam was used not only for process work but also for power work, and it was necessary to consider the relationship of the steam for power purposes to process purposes.

### Problem of Radiation Losses

Mr. J. DOUGLAS MAUGHAM said that radiation loss was a problem to which a good deal of research work had been directed. He made it out to be approximately 1½ per cent., but he could not make his unaccounted for loss at anything under 4 per cent.

Dr. GRUMELL said that even in the case of a modern boiler plant it appeared to be impossible to account for more than about 96 per cent. of the heating, of which not more than 1 per cent. could be attributed to losses by radiation and convection.

Mr. R. C. WALTHEW said it was necessary to consider the losses in heating up brick-work as well as losses by air leakage. Cooling down overnight might easily account for half a ton of fuel on a Lancashire boiler.

In reply to Mr. Gibson, Dr. Grumell said that the hydrocarbon loss was very much greater in the case of the Lancashire boiler than the water tube boiler.

Mr. A. MCCULLOCH asked whether Dr. Grumell had measured the carbon monoxide or hydrogen contents of unconsumed gases.

Dr. GRUMELL said he was dealing with the point at the present time. Some time ago it was usually assumed that the hydrogen was one-seventh of the CO present. This was now rather being disputed in certain quarters. He had tested flue gases for CO and hydrogen by the absorption of cuprous chloride. He was not very much concerned about the CO and the hydrogen. What people appeared to be most concerned about was the hydrocarbons.

# The Training of the Food Technologist

## Dr. H. B. Cronshaw lays Some Facts before the Food Group

THE training of the food technologist was the subject of a paper which Dr. H. B. Cronshaw read before the Food Group of the Society of Chemical Industry at the London School of Hygiene and Tropical Medicine on February 13. The object of the paper was to call attention to the lack of any facilities for obtaining organised instruction in the scientific principles of food technology, either at the universities or at any other institutions of similar standing. Recent inquiries among thirty university colleges and twenty-eight technical institutes for such instruction have given negative results. Similar inquiries have been made in America and Germany, but, as in this country, there appears to be no institution of university grade which possesses a department of food technology, much less one that has been organised with the specific object of providing instruction in all the sciences, both pure and applied, which appertain to food technology.

### The Food Chemist

Food technology, in the broad sense of the term, is regarded as a branch of applied biochemistry, and is therefore founded upon the basic sciences of chemistry and biology. The former includes an advanced knowledge, up to degree standard, of physical and organic chemistry, as well as biochemistry itself, while the latter embraces the principles of general biology (and, in some cases, a specialised knowledge of either botany or zoology), together with a good training in bacteriology and mycology. Hitherto the mistake has been made of regarding the term "food chemist" as synonymous with that of "food technologist," but the two should not be confused, since food technology embraces not chemistry alone but also biology and bacteriology as essential basic subjects. The true conception of the food technologist is that of one who plays an essential and important rôle in the work of feeding the nation. His sphere of influence merely begins at the laboratory bench; actually it extends even beyond the factory, on one side to the farmer and on the other to the public who consume his products.

It cannot be too strongly emphasised that the technologist is primarily concerned with the *quality* of preserved and manufactured foodstuffs. He watches and controls each step in the chain of operations from farmer to consumer. His methods are those of chemical analysis, physical tests, bacteriological tests and biological assays, and the laboratory is thus at the centre of his operations. He has to satisfy the health officials that his products contain nothing of a detrimental nature, and, at the same time, the public expects them to be attractive in flavour, colour and "eating qualities," and in these relatively enlightened days to possess vitamins, mineral salts and other special virtues.

### A High Standard of Knowledge

If the food technologist is to discharge this multiplicity of duties so as to bring credit upon himself and upon the industry which he serves, he must not only have a knowledge of the basic sciences involved—namely, biochemistry, biology and bacteriology—but the standard of this knowledge must be a high one; it must, in fact, be such as can only be reached at the university or equivalent institutions. As the matter stands at present, anyone may call himself a food technologist and the industry will probably accept him at his own valuation, which may or may not be justified by results. The industry is at present forced to take the risk and to apply the haphazard, and possibly costly, method of trial and error. There is no standard and there is no measure of proficiency. It is therefore in the interests of the industry that such a standard should be provided and this is best done by prescribing a suitable course of training.

The food industry in its relation to education stands in a somewhat anomalous position. Although it is sharply marked off from other industries by the biological, and therefore perishable, nature of its raw materials, and by the fact that its products are intended for human consumption, it is actually not a simple unit but a whole group of more or less independent industries. For example, we have the manufacture of meat products, fish products, sweets, bread, margarine, infant and breakfast foods, biscuits, jam, confectionery, chocolate, pickles, canned fruit and vegetables, each of which in itself constitutes an important, specialised occupation. Then there are other concerns occupied with the storage and distribution of certain foodstuffs. The result is that any interest in educational matters which might be stimulated in industrial circles is likely to be self-centred and parochial. The problem is to find common ground. That, however, is not difficult when the viewpoint is shifted over to the scientific side.

Before actually coming to grips with the question as to what constitutes a suitable course of training for the food technologist it is essential to examine the industry from the scientific standpoint in order to sort out the basic principles. Obviously the first requirement in this connection is some orderly scheme of classification for the main products which will throw into relief their physical-chemical relationships and correlate these with the various types of processes to which they are subjected during manufacture.

When an attempt at classification is made along these lines, one quickly realises that in the first place it can only be very imperfect owing to the diversity and complex nature of the products, particularly in the case of confectionery, and, in the second place, that there is a fundamental cleavage which sharply marks off all those products which are primarily derived from fruit, vegetables, meat, fish, milk and eggs from those into whose composition sugar and flour (or cereals) enter as main ingredients. There is also a fundamental difference in the character of the manufacturing processes to which they are subjected and the objects which these processes have in view. This gives us two main groups: Group 1. Preserved Foods, embracing preserved fruit, vegetables, meat, fish, milk and eggs in their various forms. (Products such as sauces, condiments and mayonnaise may also be conveniently included in this group.) Group 2. Bread and Confectionery, embracing sugar confectionery or "sweets"; bread; and flour confectionery, such as buns, pastry and cakes.

### Preservation of Foodstuffs

In the preservation of foodstuffs the primary object is to inhibit or to control selectively the biochemical changes which normally take place in the fresh, raw material so as to preserve it in a sound and palatable condition free from any undesirable effects of spoilage. These changes are brought about by the autolytic enzymes which are normally present in the material itself and by bacteria, yeasts and moulds which may be introduced into the material from outside sources. This object is achieved by the application of various processes, generally assisted by the incorporation in the material of substances, such as salt, sugar, vinegar and spices, which, at the same time, bring about some modification of the original flavour. In certain cases a selective, rather than an indiscriminate, suppression of micro-organisms is aimed at, as, for example, in the preparation of sauerkraut or the curing of meats.

The drying of fruit, vegetables and similar foodstuffs does not differ essentially from that of other products in which moisture is initially distributed more or less uniformly through the mass. It is largely a matter of adjusting the temperature, relative humidity, air circulation and movement of the material itself at different stages of the drying operation so as to give the most rapid loss of moisture in conformity with whatever qualities in respect of texture, colour, flavour, etc., may be desired in the final product. Little has been done from a scientific point of view, although much experimental work has been carried out by Professor Cruess and his associates in California. In England, similar work on the drying of vegetables was undertaken by Knapp during the war period.

The film or spray drying of milk affords another set of problems, as does also the drying of blood albumen, meat waste and fish products, and the vacuum drying of materials such as malt extract and eggs.

Although the smoking of meat and fish has been practised from the dawn of history, it has received little attention from

biochemists and bacteriologists. Probably the most comprehensive studies (the German work is not readily accessible) are those of Hess, in 1929, at the Halifax (N.B.) Station, on the bactericidal action of smoke, and by Griffiths and Lemon, in 1934, at the United States Bureau of Fisheries (Gloucester) laboratory, on the smoking of haddock. Actually, the process as practised is a combination of salting, surface drying and smoking. Work on the penetration of salt into fish and on associated problems is also scanty. Preliminary studies have been made by Bahr, Wille and others at Wesermünde, by Taylor, of the United States Bureau of Fisheries, and by Carter, at Nanaimo, but there remains a great territory virtually unexplored. The scientific study of bacon curing is also in its infancy, although fundamental work of great value has lately been carried out by Dr. Callow, of the Low Temperature Research Station, Cambridge. Reference should also be made to the investigations of Dr. Lewis and his associates at the American Institute of Meat Packers.

## Heat Sterilisation

Under heat sterilisation are grouped the multitude of canned and bottled fruits, vegetables, meats, fish and dairy products (even beer is canned) whose preservation is based on sterilisation by the application of heat and on protection from subsequent contamination by sealing in airtight and vacuumised containers. The basic principles involved are partly of a bio- and physico-chemical nature and partly of a bacteriological nature. The literature is abundant, but not easily accessible on account of the "closed" character of the research stations. This does not apply so much to the American institutions as to the British stations, whose reports, valuable as they are for the training of food technologists and embryo canners, are issued to a limited circle as confidential matter.

For an account of the work being carried out in connection with the storage of foodstuffs at low temperatures, or in atmospheres containing a certain proportion of carbon dioxide, one cannot do better than turn to the annual reports of the Food Investigation Board, from which it will be seen that here again physical chemistry, biochemistry and bacteriology form the basic knowledge required of the investigator and also of the practising technologist. One might mention by way of illustration the influence of time and temperature on the freezing-storage-thawing cycle, the physics of the freezing of muscle and fat, fat rancidity, the biochemistry of rigor mortis, the denaturation of proteins, the resistance of refrigerated products to micro-organisms, the physiology of fruits and vegetables in cold storage, and so on. Linked up with this is a study of the changes induced by the rapid freezing of fish, fruits, meat, milk, etc., concerning which the American literature is voluminous.

Likewise, the more recently developed practice of storing fruit, meats and eggs in the presence of carbon dioxide and under controlled conditions of temperature and humidity is one which has been initiated and developed by scientific workers, notably at the Low Temperature Research Station at Cambridge. Here also may be included the storage of citrus fruits during transit in gas fungicides, such as ammonia and nitrogen trichloride, and the use of ammonia in connection with the winter storage of cabbage.

## A Neglected Field

The making of jams and marmalades is another neglected field which provides a great opportunity for extremely interesting work of a more or less fundamental character, in the light of which one will be enabled to examine a variety of manufacturing practices which have come to be blindly accepted without adequate reason. So far, little or nothing of any scientific value has been published in spite of the many attractive problems which are presented by the subject and the important bearing which these have on practical considerations. There is, for instance, the unravelling of the factors which determine "set"; time, temperature and manner of boiling; crystallisation; mould growth; flavour; fruit texture; pre-treatment; relative contents of the ingredients (including glucose and invert sugar); and so forth.

Closely allied in some respects is the preserving of fruits in heavy syrups (Wiesbaden fruits) and the glacéing, candying and crystallisation of fruits and citrus peels, in which the rate of penetration and the nature and extent of crystallisation as influenced by sugar concentration and its degree of inversion, temperature, fruit texture, pressure, etc., are the major subjects for study.

Pickles range by way of chutneys (relishes in America) to sauces, and in the preservation of these the acetic acid content plays an important part in conjunction with a variety of spices. A sauce considered as a colloidal suspension raises questions of stability as influenced by the degree of viscosity and dispersion. Much interesting work remains to be done by the colloid chemist on this and related questions. With the exception of tomato sauce and ketchups, the literature is extremely limited. In the case of mayonnaise and salad creams, which are emulsions of oil in vinegar, the literature is much more plentiful, and in this connection one calls to mind the work of Dr. Clayton and Dr. Corran.

## Bread and Confectionery

The second main division of food products, conveniently referred to under the general term bread and confectionery, embraces sugar confectionery, in which sugar is the main, basic ingredient, and bread and flour confectionery, into whose composition wheat flour enters as the characteristic ingredient.

Compared with meat, fruit and vegetables, which are the raw materials of preserved foods, sugar and flour present striking differences in that they are simple and relatively stable bodies from which, however, generations of craftsmen have, by ingenious manipulations, built up a host of products of every conceivable form, texture, consistency, composition, colour and flavour.

Flour (or bakery) products may be taken to include (1) bread, (2) confectionery, (3) biscuits, and (4) breakfast cereal foods and macaroni. The chemistry of cereals is, thanks to the labours of Bailey and numerous other North American specialists, in quite a healthy condition and the abundant literature is usually of a high standard.

The food industry, like every other industry, is largely dependent on wisely-directed research for its advancement. This has been acknowledged by the provision of a number of stations at which research of a more or less fundamental character, bearing on the various branches of the food industry, is carried out. The most important ones are the Low Temperature Research Station, Cambridge (cold storage, etc.), the Ditton Laboratory, East Malling (fruit storage), the Torry Research Station, Aberdeen (fishery products), the Fruit and Vegetable Preservation Research Station, Campden (canning), the Agriculture and Horticultural Research Station, Long Ashton (fruit products), the British Food Manufacturers' Research Association, London (meat and fish), the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades, London (confectionery), the Flour Millers' Research Association, St. Albans (cereal products) and the National Institute for Research in Dairying, Shinfield (dairy products).

## Availability of Results

The question of the availability of the results of research to industry is a very important one. It is one with which the technologist is primarily concerned, and unless he has received an adequate training he is likely to do more harm than good. Industry cannot assimilate the results of scientific investigations without the aid of properly trained technologists. They are the enzymes, so to speak, which break down and sort out the data supplied by the laboratory and build up the selected parts into the form best suited to the particular requirements of the industry which they serve.

The great body of data which has been accumulated at the national stations during the last few years presents an impressive sight. But, unfortunately, the eyes of the food industry are bigger than its stomach, for, owing to the lack of technological "enzymes," this research matter cannot be digested, or, at any rate, only slowly and with difficulty. No one is more aware of this than the Food Investigation Board, as is clear from the following statement made in the report for 1933: "We recorded last year the initiation of a new series of publications in the form of leaflets, supplied gratis to applicants, and dealing briefly with practical problems of the storage and transport of foodstuffs, and the welcome which had been extended to it. We are convinced that these leaflets will play a most useful part in what is, perhaps, *the most difficult part of the Director's task—namely, to secure the effective translation into commercial practice of the results of the researches carried out under his direction.*"

One might divide the national stations into two classes, the "open" type and the "closed" type. The former includes those under the wing of the Food Investigation Board and the Long Ashton and Shinfield stations, while the latter

includes the London stations of the Food Manufacturers' Federation, the canning station at Campden, and the millers' station at St. Albans. Those of the open type publish their work so as to be readily accessible to everybody; the closed stations impound the results of their work for the benefit only of those firms that contribute financial support.

Without stopping to consider whether it is morally right or wrong, practicable or impracticable, to impound for selective distribution knowledge which has been partly obtained at the expense of public funds, it is clear that a "closed" policy in respect of nationally important research is not acceptable to those who desire to promote the unprejudiced distribution of knowledge among all who are likely to profit from it. Particularly does this apply to the technological students who are about to enter the industry with the intention of bringing to bear on its practical problems the most up-to-date information that exists. If a large part of this is withheld from them, a part that is particularly valuable as it relates to just those very problems with which they will have to deal, does not this constitute a short-sighted policy on the part of industry and one which is likely to have disastrous results?

It would almost appear that in adopting the "closed" policy of national research we have reverted to the ways of craft secrecy, which have been shown beyond doubt to be inimical to progress. Furthermore, it is not in keeping with the spirit of co-operative research, whose true function is to relieve individual firms of the more fundamental work which it would not be profitable for any one of them to undertake. Although necessary, work of this kind will not yield immediate benefits or tangible results commensurate with their cost, and they may not be directly applicable to the operations in any particular factory. The prosecution of studies that are in the nature of specialities or company secrets can well be left to the companies themselves; they should not be matters of any concern to national or co-operative research.

# Water Supplies: Industrial and Domestic

## An Immediate Need to Avoid River Pollution

THE annual report of the Water Pollution Research Board for the year ended June 30, 1934 (H.M. Stationery Office, 9d. net), points out that there are many undertakings utilising polluted river water, after treatment, for domestic and industrial supplies, and there is no doubt that other polluted rivers will have to be similarly utilised in the future to meet the increasing demands of the community. It is therefore important that further efforts should be made to prevent, as far as possible without unnecessary expense, the pollution of rivers and streams and other sources of water supply if expensive methods of water treatment and danger to public health are to be avoided. This necessitates intensive, systematic research, as in many cases entirely satisfactory methods of treatment and disposal of trade effluents at a reasonable cost are not known. Further, as industry develops, new processes of manufacture are devised and new methods of dealing with the waste waters will be required.

Much of the work of the Board has been carried out with the objects of solving existing problems and of obtaining fundamental information to enable the problems of the future to be dealt with as expeditiously as possible. Investigations may be divided into four main groups dealing respectively with purification of water for public supply, methods of treatment and disposal of sewage, methods of treatment and disposal of trade effluents and various problems of river pollution.

### Water Softening

With regard to water for public supply, many experiments have been carried out with the object of ascertaining the effects of various factors on the treatment of water by the base-exchange process of softening. This subject is of great importance not only to domestic consumers but also in many industrial processes such as in the bleaching and dyeing of textiles, in laundries and in steam-raising where soft water possesses many advantages. In the base-exchange process the calcium and magnesium salts which cause the hardness are removed and replaced by sodium salts by passing the water through granules of material consisting of complex sodium aluminium silicates. It is employed by some water supply undertakings and is the basis of most of the household water softeners now used in large numbers in various parts of the country. The softening materials are either treated minerals or clays the whole of which are imported, or chemically manufactured synthetic materials prepared in this country or abroad.

During the past two years experiments have been carried out on methods of treatment of British clays with the object of preparing base-exchange material suitable for water softening. Many samples of clays have been employed and a method of treatment has been devised whereby prepared clays have been produced with water softening capacities greater than those of some imported materials at present in use.

Further experiments have been carried out in the laboratory on methods of treatment of the waste waters discharged from dairies and milk products factories. These effluents may seriously affect rivers and streams into which they are discharged and may be many times as strong in polluting character as domestic sewage. The problem is of particular importance at the present time owing to the expansion of the milk industry and the increase in the number of large centralised factories and milk collecting and distributing depots.

During the past year many cases of serious difficulty and pollution of streams by such effluents have arisen. The experiments have indicated that there are methods whereby the effluent can be satisfactorily purified before disposal and a stage has been reached at which the processes suggested should be tested on a large scale. The industry has been informed of the progress of the work and has been offered the opportunity of co-operating both technically and financially in the further investigations which are desirable.

Considerable progress has been made in fundamental investigations of the biology and chemistry of methods of purification of sewage. The processes at present in use have been developed largely as the result of empirical work and there is no doubt that investigations of the kind initiated by the Board are necessary if further progress is to be made and improved methods of purification are to be devised.

# German Wool Substitutes

### New Products not Satisfactory

THE whole scientific and commercial resources of Germany have recently been concentrated on the production of wool substitutes, and great hopes have been held as to their capacity to replace a large part of the country's requirements of foreign wool.

The principal of these so-called new fibres is known as "vistra," rayon (viscose) fibre, produced in continuous filaments, as in the case of rayon, and subsequently cut into such fibre-lengths as required. An investigation of a range of German-made suiting cloths produced from "woolstra" ("vistra" mixed with wool) reveals several features. On analysis they were found to be composed of 50 per cent. good quality virgin wool and 50 per cent. "vistra." They were strong and of good appearance, but very deficient when compared with all-wool fabrics. "Vistra," like other so-called wool substitutes, has a cellulose origin, which provides the material with properties similar to yarns and cloths produced from cotton. On this account the fabrics lack elasticity and draping property, hence they crease easily, and garments made from them are liable to lose shape, and the wearing properties are unsatisfactory.

Although one can anticipate great improvements in synthetic fibres it is not yet clear that Germany can make herself independent of wool. The German Government is to-day granting licences for the importation of wools, tops and yarns in so far as their present state of currency will allow.

# Electron Diffraction and Surface Structure

## Professor Finch's Lecture to Oil and Colour Chemists

PROFESSOR G. I. FINCH gave a lecture on "Electron Diffraction and Surface Structure," at the meeting of the Oil and Colour Chemists' Association, in London, on February 14. Dr. J. J. Fox was in the chair. Professor Finch began with a reference to De Broglie's suggestion that the electron has a pulsating nature which gives rise to a wave effect as the electron passes any particular point. He then mentioned G. P. Thomson's work which, in 1927, provided an experimental support for this hypothesis, work which Professor Finch characterised as the most important carried out in the last 30 years. Professor Finch explained that any such wave impinging on a regular system of diffracting points will give rise to a family of emergent beams in directions such that from a plane perpendicular to the beam, the distance back to the respective diffracting points differs by a whole number of wave lengths. The location of these beams can be determined by placing a fluorescent screen in their path or by taking a photographic record. From a knowledge of their directions with a known incident wave system the separation between adjacent diffracting points can be determined and hence the structure of a solid material—crystalline or otherwise—used as a diffraction object can be elucidated.

### Use of the Electron Camera

In the electron camera described by Professor Finch, an electron beam approximately 1/10th mm. in diameter is focused and directed by electromagnetic and electrostatic fields on to the diffraction object, which is held by a universally adjustable clamp, the whole apparatus being highly evacuated. With a completely random distribution of diffracting points, a mere haze is produced on the photographic plate but, as soon as orderly arrangement is introduced in the object by crystallisation, pattern is produced on the plate. If a layer of crystals is randomly distributed with all similar faces on one plane, the diffraction pattern produced is a series of co-centric circles. If the orderliness of the object is carried a stage farther and all similar crystal faces are parallel to each other, then the pattern produced consists of a series of points in orderly array. From the constants of the instrument and the spacing of these points, the structure of the crystal lattice of the object is found.

The penetrating effect of these electron beams is very small and usually, therefore, only surface structures can be studied. With X-rays, the opposite is true and solid structures are studied more easily than surfaces. Most of the results described by Professor Finch were concerned with metal surfaces. He has shown conclusively that Beilby's hypothesis that a layer of randomly disposed molecules is formed on the surface of a metal or glass during polishing, is correct. He has found that the oxide film formed on metallic zinc has a structure which is distorted to fit in with the structure of the zinc itself and, indeed, that substrates in general impose their structure on at least the first superposed atomic layer of other compounds which are formed in situ. A very thin film of aluminium, at first random in atomic distribution, develops a crystalline structure on ageing at an elevated temperature. Similarly a very thin film of acetyl cellulose, at first random or non-crystalline, gradually becomes crystalline in structure on ageing at ordinary temperatures. Moreover, this change is affected by the type of the solvent which has been used to deposit the film. Thus, from an acetone solution, acetyl cellulose is deposited in a form showing greater crystallisation than that obtained from an ether-alcohol solution. Electron diffraction studies with linseed and tung oil films are now being attempted in Professor Finch's laboratory.

### Points from the Discussion

The CHAIRMAN said the lecture had been one of the most fascinating that had ever been given before the Association. The method described was one of the coming methods to be used in connection with the chemistry of paints and varnishes. At the moment he believed the cost of the apparatus was appalling, although perhaps not so for the rich institute with which Professor Finch was connected. However, he did not think it was too much to say that in the perhaps not very distant future, it would be possible by this method to learn what was happening in a tung oil or a linseed oil surface, and to control it. One satisfactory feature of this work, concluded the chairman, was that Professor Finch had restored the credit of the profound investigations carried out by Beilby many years ago, which our Continental friends did not like.

Dr. G. F. NEW said they were watching, as it were, the birth of a new technique, but the results in which most of those present had the strongest interest were simply not yet available. This method of analysis and new technique of investigation would have a tremendous application to all surface problems which constituted most of the paint and varnish technique. The deposition of aluminium on platinum seemed to him to be directly analgous to the problems of the paint and varnish industry associated with the deposition of organic compounds on metal surfaces and other organic surfaces. Moreover, he felt that this new technique would give some explanation of the problems of adhesion, which everybody had been worried about for years, but with which nobody had yet made any real progress. There were innumerable problems in the paint and varnish industry that were concerned with this technique, such as driers, wetting agents and even polymerisation of oils, and it seemed to him that in the near future we should have quite a number of hypotheses which everybody now so glibly put forward, either replaced or substantiated by facts.

### Aluminium on Platinum

Dr. VERMAN, referring to the deposit of aluminium on platinum, asked what would happen if, for example, a further layer of aluminium was deposited on the first layer of aluminium; would the particles have the same restricted lattice as the first deposit or would they form their own natural lattice?

Professor FINCH replied that the constricted form of aluminium tetragonal which he had indicated was only obtained in an exceedingly fine film, and if it exceeded a thickness of one-millionth of a centimetre it rapidly went over into the ordinary aluminium. The change-over was exceedingly rapid; so rapid, indeed, that it had not been possible yet to observe the transition point between the two forms of aluminium, the normal form and the tetragonal form.

Dr. G. BELL, speaking of the crystallisation of cellulose, said he understood that Professor Finch could carry out a transformation of cellulose into the crystalline stage, and presumably eventually he would be able to form some idea as to the time taken for this crystallisation to take place. Eventually, perhaps, it would be possible to indicate from electronic diffraction the exact age of a film of cellulose, for example. That same process might also be applied to a film of oil or synthetic resin or other finishing material from the point of view of working backwards from the changes which took place.

### Examination of the Film

Professor FINCH said he thought that could be done. It was possible to prepare a cellulose acetate film by making a dilute solution of cellulose acetate in alcohol ether and dropping a drop of that solution on to a dish of water, which would sweep all the dust particles which were in a film of cellulose. That film could then be examined by electron diffraction. A film prepared in that way was invariably non-crystalline but, on keeping, it became crystalline. He had not, however, made a systematic examination of how long it would have to be kept for it to become a single crystal. On the other hand, if he took acetate cellulose and dissolved it in acetone and formed a film in that way it could be taken that he would be beginning with a fairly well crystallised film. The molecules had started to line up very nicely. Many of them had formed up into crystal systems which had joined up with one another and they aged much more rapidly than those which had been formed with alcohol ether. Thus, from a simple observation like that the technique was sufficiently advanced to enable cellulose films produced in different ways to be examined from the point of view of the paint manufacturer, who could thus have his film crystalline or

not. He did not know, however, whether there was any virtue in having a film which got to the single crystal stage rapidly or slowly.

Dr. NEW asked Professor Finch whether he had been able to bring about any molecular rearrangement by strong electric or electromagnetic fields, and to obtain the same results as those obtained with high temperature.

Professor FINCH said he had not made any such attempt, and was grateful to Dr. New for the suggestion because he thought it was well worth trying out. There were one or two things he could think of at once which would be well worth trying out in this way. Unfortunately, however, there were so many problems to be dealt with that it was difficult to find time for them all. In his laboratory there were only six diffraction cameras and they were working morning, noon and night. Work was being done as fast as possible and it was very difficult to know which problems should be given priority.

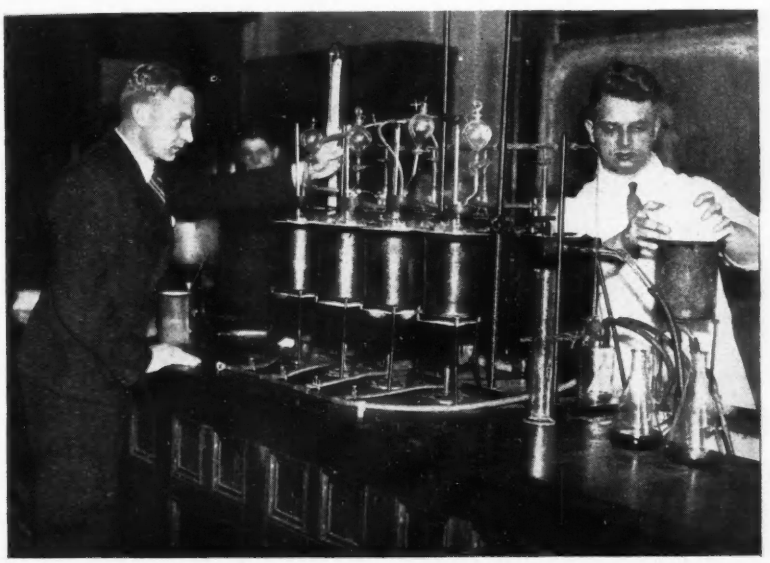
On the motion of the chairman, a vote of thanks was passed to Professor Finch.

# Demonstration of New Wool Dyeing Discovery

## Pictures from the Bradford Laboratory

WIDESPREAD interest was aroused by the demonstration of the new process for wool dyeing, embodying the results of discoveries by the Dyestuffs Group of Imperial Chemical Industries, Ltd., which was held in the chemical laboratory of the Bradford Technical College last week, a special report of which appeared in THE CHEMICAL AGE of March 2 (page 198). The accompanying photographs were taken in the chemistry lecture theatre. We are indebted to the Editor of "The Dyer and Textile Printer" for the loan of both the illustrations and permission to reproduce them.

**Dr. H. A. Thomas, who conducted the demonstration is second from the right behind the bench. In front, to the left of his assistant are Mr. H. Jackson, Chief Colourist to the B.D.C., and Mr. D. Carter, Assistant Chief Colourist, who took a leading part in the discovery of the Process.**



**Dr. H. A. Thomas and his assistant demonstrating the new Wool Dyeing Method evolved by Imperial Chemical Industries, Ltd., at Bradford on February 25.**

# New Methods for Manufacturing White Lead

By M. SCHOFIELD, B.Sc., A.I.C.

ALTHOUGH new uses and the total production of basic lead carbonate have not been increased to any extraordinary degree, yet more efficient methods, if efficiency be measured by saving in time, are constantly appearing. The recognition of the substance as a definite compound rather than a mixture of lead carbonate and hydrated oxide has stimulated the study of possible methods for producing it in shorter periods than the 120 days required by the Dutch or "Stack" process.

## The Dutch Process

The Dutch process is now carried out in corroding houses in which the layers of pots are placed over layers of tanbark, the latter replacing the use of dung; the corroding house usually takes from eight to ten tiers of pots. By fermentation of the spent tanbark temperatures up to 180° F. are often attained, and while thermophylic bacteria were solely the cause of this liberation of heat in the dung processes, it is not definitely established that specific bacteria alone in tanbark can yield so high a temperature. All modern Dutch methods require a high-grade form of lead pig, for any impurities originally present are not eliminated as is the case in other methods of conversion. Silver, bismuth and copper should be removed until a value below one-hundredth of one per cent. is attained. Acetic acid solutions are usually of 2 to 3 per cent strength, and although some of this raw material is lost as basic acetate remaining in the white lead, yet the presence of this does not detract from the value of the product.

## Some Modern Modifications

A number of modern processes are modifications of Thénard's method, which consisted in preparing basic lead acetate and passing carbon dioxide into the solution. The first modification of importance is Matheson's process, in which white lead was precipitated by use of carbon dioxide, the neutral lead acetate thereby formed being now re-boiled with a suspension of litharge to form the basic acetate which is returned to the process. This process appears to have been suspended, but attention to Thénard's scheme is raised by the appearance of certain patents within recent years. One of these stipulates the use of a mixture of litharge and acetic acid which is sprayed through a current of $CO_2$; a second patent describes the whipping into an atmospheric suspension of a similar mixture within a revolving closed container through which both air and $CO_2$ circulate at a definite rate. A further modification, which has been brought to commercial success, covers the production of a basic carbonate by Thénard's method, the product containing equimolecular proportions of $Pb(OH)_2$ and $PbCO_3$. This is now mixed with the correct proportion of the normal carbonate, the latter being obtained by continuation of Thénard's precipitation with $CO_2$ until the suspension is converted to $PbCO_3$ almost completely. The product is equal in opacity and properties to that of the Dutch process.

## Recent Advances

Further advances were attained when the use of comminuted or atomised lead was tried out, the idea being to accomplish in a fortnight the conversion normally requiring 18 weeks exposure in the stack. U.S. Pat. 1,655,723 recommends the use of a rotating cylinder containing powdered lead and quartz pebbles, an atmosphere of $CO_2$, steam and air being blown in. In processes adopted in practice, less than two tons of finely divided lead constitutes a batch, this amount being fed into wood-lined rotary cylinders. The lead is now treated with carbon dioxide and acetic acid, a dilute form of the latter being sprayed in for replacing losses. Rotation of the cylinders carries the dispersed lead upwards and exposes fresh surface for corrosion, the process being sufficiently exothermic for dispensing with external heat supplies.

As in many other chemical industries, electrolytic methods have entered the field in white lead manufacture. Fifty years ago Roth and Sylvester suggested a process in which acetic acid formed at a lead anode yields lead acetate, which is now caused to react with sodium hydroxide formed at the cathode, white lead being formed on the admission of carbon dioxide. The Sperry process (Ger. Pat. 391,692) has now been adopted on a commercial scale. In this case a solution of sodium acetate is electrolysed between anodes of lead and cathodes of iron or copper, $CO_2$ being passed in round the latter poles, and a diaphragm being utilised to surround the cathode. The sodium hydroxide is partially carbonated and diffuses through the porous diaphragm into the anode liquor of lead acetate, the latter being formed by discharge of the acetate ions at the lead pole. The final product contains excess normal lead carbonate according to one authority, but the particles are very fine and white and the continuity of the process is another asset. From the anode liquid there settles a thick mud of white lead, which is filtered through a press, washed, dried and ground in the usual way. Among alternative schemes for electrolytic production is the use of sodium chlorate as a catalyst in the solution charged with carbon dioxide (Eng. Pat. 298,520), the lead product being allowed to settle in the electrolytic cell itself. As an alternative oxidising agent sodium nitrate has been suggested, a solution of this together with an addition of a water-dispersible colloid being used (in the method given in Eng. Pat. 380,457, for example) as electrolyte. Lead electrodes, a current density of 20 amps. per sq. ft., and withdrawal of electrolyte for partial carbonation are further conditions advocated.

## Action of Carbon Dioxide

Recent studies of the formation of white lead under various conditions have been made by A. Sauer and M. Zipfel. By the action of $CO_2$ on basic acetate of lead it has been shown that the product is definitely $2PbCO_3\ Pb(OH)_2$, that the best result is attained by avoiding excess of carbon dioxide, and that a high temperature is more favourable to the desired reaction. It is also advisable to maintain a definite $p$H control in the solution and, in order to obtain a highly dispersed product, to use a colloid as indicated above. While secondary aggregates are liable to be formed, yet the degree of dispersion of the bulk of the product appears to depend more on the conditions, a high dispersion not necessarily being confined to the Dutch method. Other workers have acquired patent rights for use of sodium carbonate, sodium hydroxide and $CO_2$, and soduim bicarbonate for introducing the basic carbonate radicles under various stipulated conditions; some of these start with lead chloride, or with waste plumbiferous material treated with sodium chloride, others use litharge dispersed in dilute acetic acid, or in nitric acid or ammonium nitrate solution. J. F. Sacher has studied the action of ammonia and carbon dioxide passed into a pulp of litharge prepared in a pressure vessel, whereby a quantitative conversion is claimed, excess gases being recovered and returned to the system. A. I. Kogan has shown that the opacity of white lead falls with the formation of excess carbonate of lead above the equational amount.

As a final point, mention should be made of a method of eliminating poisonous soluble constituents from the product of the Dutch method. It is recommended (Eng. Pat. 315,637) that a continuous stream of sodium bicarbonate solution should be passed into the pots or tanks, any lead acetate being thereby converted completely to carbonate. The product is then washed in the filter press until free from sodium acetate.

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## German Potash Sales

EXPORT sales of German potash in 1934 increased 44 per cent. to 704,029 metric tons, compared with only 514,150 tons a year ago and 461,004 tons in 1932. The value, however, suffered another decrease of 7 per cent., to Rm.19,963,000 from Rm.21,360,000 in 1933 and Rm.23,408,000 in 1932. This reflects the increased world competition and lower prices. In 1934 exports to all countries increased as far as quantities are concerned. Holland was again first on the list with 208,108 metric tons, compared with 139,424 tons in 1933; Belgium came next with 114,254, against 60,424 tons. Exports to the United Kingdom increased from 37,879 to 39,464 tons. Among the few countries which took less German potash were the United States, with 98,805 tons, against 101,875 tons. Total sales of the German Syndicate increased to 1,220,000 tons of pure potash, compared with only 937,000 tons in 1933.

# New Books for Chemical and Allied Industries

## Some Noteworthy Spring Publications

GEORGE ALLEN AND UNWIN, LTD., have recently published "A History of Food Adulteration and Analysis," by Frederick A. Filby (10s.), which provides for the first time a connected account of the development, through ancient and medieval times, of those practices of food adulteration which came so much into prominence during the nineteenth century, and traces their decline in our own times. Here and there opportunity has been taken to sketch parts of the history of organic chemistry, and throughout the whole of the book the attitude of the Law has been carefully studied.

* * *

E. AND F. N. SPON, LTD., include among their new and recent books, "Technology of Cellulose Ethers," a theoretical and practical treatise on the origin, history, chemistry, manufacture, technical applications, and analysis of the etherified celluloses and carbohydrate carboxylate ethers, by E. C. Worden. This is a new work dealing with the etherified derivatives of cellulose, both alkyl and aryl, and offers a source for information on its industrial possibilities in the following fields: Alcohol and other solvents, rayon and viscose, plastics, dyestuffs, cellulose and cellulose esters, textile finishing, photography and moving pictures, explosives, wood-pulp manufacture, paint, lacquers and varnishes, artificial leather, celluloid, glass, stencil and the arts. Complete in 5 vols. 3,788 pp., with illus. £13 10s. net.

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MACMILLAN AND CO., LTD., include among their recent publications "Food and Health," by Henry C. Sherman. This volume guides the reader in the daily choice of food, and justifies its publication by the recent advances of knowledge in this field which offer so much that is of interest and importance to the individual reader; also by the fact that it is now possible to summarise all the aspects of the food problem in a co-ordinated way. The price of the volume is 10s. 6d. net. Also included in Macmillan's list of forthcoming books is "Physical Principles and Applications of Magnetochemistry," by S. S. Phatnagar, Lecturer in Physics, Lucknow University. While primarily intended for the chemist and the physicist, it will be of interest also to workers in the allied branches of metallurgy and engineering. As this is the first book in English on the chemical side of magnetism, the presentation has, of necessity, been such as to provide to the man who has been introduced to the subject for the first time a readable and easily comprehensible account of the fascinating subject of magnetism and molecular structure. It also furnishes investigators in physical chemistry and physics with a more or less complete and up-to-date account of theoretical and experimental researches in this field.

* * *

WILLIAM HEINEMANN, LTD., have recently published "Physical Chemistry," by A. J. Mee (15s.). This book is at once a complete text-book of physical chemistry, well adapted to the needs of the university student and of value to the chemist who wishes to rebuild his scientific outlook on a modern plan. It includes a full treatment of recent work on atomic physics in its special relationship to physical chemistry; such matters as the structure of the atom, the electronic theory of valency and the modern theories of complete dissociation are not treated merely as addenda, but are combined to form a clear picture of the science as we see it today. "The Ideas of Physical Chemistry," by H. and H. A. C. McKay (7s. 6d.), provides in a short and most readable form a series of brief surveys of the fields in which the greatest advances in physical chemistry have recently been made. The young student (or the elderly chemist) can, in a few hours, gain from it clear ideas of the plan and progress of the scientific campaign in such areas as isotopes, transmutation, chemical linkages, molecular spectra, chain reactions, surface phenomena and colloid chemistry. The book does not pretend to teach these subjects, but it gives in palatable form the principles from which they spring.

Another Heinemann book which fills an undoubted gap is "Crystal Chemistry" (6s.), an able translation, by Dr. R. C. Evans, of Dr. O. Hassel's well-known "Kristallchemie," with the addition of sections on certain recent advances in the subject. The study of crystal structure has thrown light into so many dark corners of chemistry—the structure of the mineral silicates and the metallic alloys spring to the mind as instances—that it is very necessary for the modern chemist to acquaint himself with its technique and progress. The great part played by the sizes of atoms and ions in determining the compounds they form is strangely neglected in text-books of chemistry. This book supplies, in a clear form and at a low price, an ideal introduction to the subject.

Among forthcoming Heinemann publications is a small practical handbook by Professor E. B. R. Prideaux, "A Laboratory Course in Elementary Chemistry" (3s. 6d.). Mr. R. P. Bell is translating Professor Nils Bjerrum's world-famous text-book of "Inorganic Chemistry," already appearing (or shortly to appear) in Danish, German, Spanish and Russian. This little book—very suitable for those taking engineering or medical courses—shows the genius of its author in its beautifully lucid explanations of theory, its masterly selection of matter and its practical outlook towards the world of industry.

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THE ENGLISH UNIVERSITIES PRESS, LTD., has in preparation an original little book on the "Kinetic Theory of Matter," which is specially written for students of chemistry, who, of course, require a knowledge of physics at once sufficient, and of the right kind. The author, Mr. C. H. Creasey, is well known for his work in the scheme for education in the gas industry. He also knows the chemical industries well, and is a man with a marked gift for clear writing.

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EDWARD ARNOLD AND CO'S most interesting forthcoming book is "The Chemistry of Cement and Concrete," by F. M. Lea, M.Sc., A.I.C., and C. H. Desch, D.Sc., Ph.D., F.I.C., F.R.S. Dr. Desch's book on the chemistry of cement has been out of print for a few years, though in continuous demand; the new work is much fuller, dealing with all aspects of the subject; it runs to over 400 pages and is fully illustrated. Among the topics dealt with in the 24 chapters are: Raw materials and manufacture of Portland cements, cement components and their phase relations, cementing qualities, constitution, burning of Portland cement, proportioning, hydration, setting and hardening, action of acid and sulphate waters on cement, physical and mechanical properties, pozzolanic cements, cements from blast-furnace slag, aluminous cement, some special cements, concrete aggregates, resistance of concrete to destructive agencies of all kinds, examination of concrete failures. The book will be ready in May, and will cost about 25s. net.

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CHAPMAN AND HALL, LTD., have these last few months published many important books for chemists and students. Amongst the outstanding volumes may be mentioned "The Principles of Motor Fuel Preparation and Application," by Professor Alfred W. Nash and Dr. Donald A. Howes (30s.), of which the first volume appeared some very short while ago, and the second volume will be published towards the end of March. In the first volume the authors, Professor Nash, who is head of the Department of Petroleum Technology at the University of Birmingham, and Dr. Howes, of the Research Department of the Anglo Persian Oil Co., Ltd., deal with the principles of distillation, production by distillation, production by cracking, extraction from natural gas, refining, storage, distribution, etc. The second volume, which will be published towards the end of March, will deal with such subjects as analysis, the significance of gum and sulphur, engine and motor fuel performance, specifications, aviation fuels, etc.

What may be looked upon as the companion work to "The Principles of Motor Fuel Preparation and Application" is Mr. Harold Tongue's book, "The Design and Construction of High-Pressure Chemical Plant" (30s.), which is a thoroughly up-to-date work which will prove of value to all concerned with high-pressure plant—and the number grows daily. The author has, in this book, brought together sources of scattered information of this interesting and increasingly important subject and has described personal experience of

high-pressure chemical plant extending over many years in the Chemical Research Laboratory, Teddington.

Chapman and Hall, Ltd., are still continuing their important series of Monographs on Applied Chemistry, which is under the editorship of Dr. E. Howard Tripp. "Conductometric Analysis," by Dr. Hubert T. S. Britton, deals with the principles, technique and applications of conductometric analysis, and the author is lecturer in physical and inorganic chemistry at the University College of the South-West of England, Exeter.

Mr. C. H. Douglas Clark has just written the first volume, which Chapman and Hall, Ltd., have recently published, of "A Comprehensive Treatise on Atomic and Molecular Structure." This volume entitled "The Electronic Structure and Properties of Matter" is the first of three volumes, of which it can be safely said that no other book in English covers the same ground, nor is there anything written from the same point of view. It is an ambitious programme for Mr. C. H. Douglas Clark, who is assistant lecturer in inorganic chemistry at the University of Leeds, and he has made an excellent start, and there is no doubt that his work should be of value to chemists and to physicists also. The second volume is in active preparation, and it is hoped to issue this some time towards the end of the year, and the third volume will appear soon after.

A further recent book published by Chapman and Hall, Ltd., is a translation of the work by Dr. Fritz Zimmer, "Nitrocellulose Ester Lacquers; their Composition, Application and Uses," Mr. H. K. Cameron, the translator, has given an exceptionally fine translation of this book, of which the work falls under three clear sections, the first devoted to the properties of raw materials used in the manufacture of nitrocellulose ester lacquers, the second covering early and modern nitrocellulose lacquers, while the third deals with methods and fields of application.

Of the forthcoming books that Chapman and Hall, Ltd., are about to publish may be mentioned the important work by Dr. Donald A. Howes on "Hydrogenation of Coal and Oil." This will form the ninth volume in the series of monographs under the editorship of Dr. E. Howard Tripp. A new edition of Austin M. Patterson's "A German-English Dictionary for Chemists" will be published this month; this volume (15s.) has had one of the largest sales for reference works specifically for chemists and students.

A new edition of Van Nostrand's "Chemical Annual" will also be ready immediately, and also the fifteenth volume of that well-known annual, "Organic Syntheses." A further new edition, making the fourth, will be ready later in the year of the first volume of "Perfumes, Cosmetics and Soaps," by W. A. Poucher; this volume is a dictionary of raw materials, together with an account of the nomenclature of synthetics.

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THE TECHNICAL PRESS, LTD., announce the recent publication of "Laundry Chemistry," by A. Harvey, 2nd edition, revised (4s.). This is a handbook on the chemistry of laundry materials and methods. It sets forth intelligibly, yet concisely, the chemical principles underlying the science of the launderer. A large amount of useful information is contained within its pages. The practical laundry man who possesses no knowledge of chemistry will have no difficulty in following Mr. Harvey's exposition, and cannot fail to have his appetite sharpened for further knowledge.

Works in course of preparation by The Technical Press, Ltd., include "Applied Chemistry," a practical handbook for students of household science and public health, by C. K. Tinkler, D.Sc., F.I.C., and Helen Masters, B.Sc. Vol. I, Water Detergents, Textiles, Fuels, etc., third edition, thoroughly revised (15s.); "Industrial and Manufacturing Chemistry: Part II—Inorganic," by Geoffrey Martin, Ph.D., D.Sc., F.C.S., in two volumes (28s. per vol.); "Liquid Fuels: Their Manufacture, Properties, Utilisation and Analysis," by Harold Moore, M.Sc.Tech., F.C.S., M.I.P.T., A.I.Mech.Eng. (about 30s.). The last named book is intended as a guide to engineers in charge of oil-burning installations and also to chemists who have to deal with the valuation of liquid fuels. It is also intended to be of use to the oil industry in indicating the nature of the problems encountered in the use of their products.

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LONGMANS GREEN AND CO., LTD., are expecting to publish a further volume—the 14th—of Dr. Mellor's "Comprehensive Treatise on Inorganic and Theoretical Chemistry." They are also expecting to have ready "Origins and Development of Applied Chemistry," by J. R. Partington, M.B.E., D.Sc.; a fourth edition of Perkin's "Qualitative Analysis: Organic and Inorganic," revised by Julius Grant, Ph.D., M.Sc., F.I.C.; "A School Chemistry: Revision Notes and Questions," by F. W. Goddard, M.A., F.C.S., and S. R. Humby, M.A. In addition to these books they will have ready the second volume of the Supplement (N-Z) to Thorpe's "Dictionary of Applied Chemistry," which is being prepared by Professor J. F. Thorpe and Miss M. A. Whiteley.

Professor Partington's "Origins and Development of Applied Chemistry" will give a systematic account of the sources, production and uses of metals, ceramic products, glass, salts, gems, minerals, dyes and other materials in Egypt, Babylonia and Assyria, the Ægean, Asia Minor, Syria and Palestine, from the earliest times to the beginning of the Iron Age. Since the further developments in applied chemistry are mainly very recent, the ground covered is really much more extensive than this limitation in date would suggest, and in some cases later processes are included. The history of chemistry cannot properly be appreciated without a critical and adequate survey of the earliest origins, and the present work is the first in which this is attempted. The fourth edition of Perkin's "Qualitative Analysis: Organic and Inorganic" has been thoroughly revised, the reactions have been brought up to date and a number of additions have been made in order to introduce the student to modern trends in qualitative analysis. For example, the elements of microanalysis, which are of considerable educational value (particularly in the acquisition of laboratory technique), are discussed and illustrated in both the inorganic and organic sections. Micro-reactions, many involving the use of modern organic reagents, are given for most of the inorganic ions. They will be found of great value to the student later in his career, and some are valuable confirmatory tests. The "rarer elements" are now distributed throughout the text in their appropriate groups. Methods of separation are indicated and the number dealt with has been considerably extended. Additions have also been made to the various organic sections, notably to that on the alkaloids.

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THE CAMBRIDGE PRESS are including in their spring publications "Ortho-Hydrogen, Para-Hydrogen and Heavy Hydrogen," by A. Farkas. This new volume in the Cambridge Physical Chemistry series is the first book about "heavy hydrogen." The investigations of the last few years have revealed that the hydrogen is not such a simple gas as it was originally assumed. It was shown in 1929 by Bonhoeffer and Harteck that ordinary hydrogen is a mixture of two gases, of ortho- and para-hydrogen having distinctly different properties. In 1931, Urey, Brickwedde and Murphy discovered the existence of a third sort of hydrogen, of heavy hydrogen. The purpose of this book is to describe the preparation, properties and chemical behaviour of these different kinds of hydrogen and to illustrate how the investigations connected with this subject have contributed to the solution of some chemical and physical problems. The book is priced at 12s. 6d. net.

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THE OXFORD UNIVERSITY PRESS includes among its recent books "Chemical Kinetics and Chain Reactions," by N. Semenoff. The work is divided into four parts with a final summary of results. In Part I the general principles of the chain theory are outlined together with the simple mathematical apparatus involved. Parts II-IV contain a comparatively detailed analysis of the experimental data on the kinetics of nearly fifty chemical reactions, which are interpreted on the basis of the theory developed in Part I. In the summary the author gives a general review of the main conclusions arrived at. More than half of the results reported in the book relate to the last four years, during which a great deal of work has been done both in America and Europe, especially in the U.S.S.R. The price is 35s. net.

A new volume has also been added to the Oxford Engineering Science Series, "Distortion of Metal Crystals," by C. F. Elam. The book summarises and analyses the most important investigations on the changes in structure and physical and mechanical properties of metals when they are deformed plastically. The preparation and deformation of metal crystals are first described, together with their resistance to distortion and property of hardening. The behaviour of the crystal in a polycrystalline aggregate, the change in structure of such aggregates and the change in mechanical

properties are then compared. Alloy crystals and aggregates are similarly treated. A section deals with deformation by twinning and another with fatigue-testing, and the changes in internal structure revealed by X-rays are also referred to. The effects of temperature and rate of testing, etc., are considered. The most important changes in physical properties are noted and the whole position summarised and reviewed in order to see how far existing theories go towards providing an explanation of all the phenomena observed. The price is 15s. net.

Included in the books to be published in the spring of 1935 is "Organic Solvents: Physical Constants, Methods of Purification," by Arnold Weissberger and Eric Proskauer. In recent years improvements in the methods of organic chemistry and the enhanced interest in the chemical physics of non-aqueous solutions have led to an ever-increasing demand for variety and purity in organic solvents. For this reason it has seemed desirable to make a collection of physical constants and of the methods of purification for these solvents.

# German Anthracite Hydrogenation

## Operation of Large-Scale Experimental Plant

A DESCRIPTION of the operation of a large-scale experimental plant for direct hydrogenation of anthracite, which has been working continuously from September to December, 1934, at the works of the I. G. Farbenindustrie, was given by Dr. M. Pier in the "Chemische Fabrik" of February 6.

Raw material with 2 to 5 per cent. ash content is roughly broken up before grinding to a paste with heavy oil (a product of the hydrogenation process itself). At the same time the catalyst, also ground in oil, is incorporated. The resulting paste, containing 50 to 60 per cent. of anthracite, can easily be pumped in the warm state. Under 300 atmospheres pressure it is forced into a pre-heater where, in admixture with the hydrogen, it is brought to a temperature of 410° C. before entering the first of a series of reaction chambers arranged one behind the other. This part of the plant is located in a concrete housing. Each furnace is about 12 metres in length and provides a reaction space of about 3 cu. metres. In the first furnace the temperature rises rapidly to 460° C. (the optimum) and medium-heavy oil, benzine and minor quantities of gaseous hydrocarbons are formed. Additional quantities of catalyst, suspended in oil, are sprayed into the reacting mass. Excessive rise in temperature is prevented by introducing cold oil, coal paste or gas at the over-heated localities. The reaction is completed in a second chamber when the products are passed on to a separator maintained only a little below the hydrogenation temperature. From here the heaviest liquid oils are run off as sludge in admixture with the suspended ash and coal residues. Vapours of the lower boiling oils and the gaseous products were led off from the upper part of the separator. The liquid level in the separator was kept constant to ensure sharp separation of the liquid and gaseous products.

The hot vapours emerging from the separator enter the heat exchanger where they serve to heat up the raw materials on their way to the reaction furnaces. Separation of the liquid and gaseous products follows in a cooling apparatus and is effected with great ease under the high working pressure.

The liquid products separated in this part of the apparatus represent about 70 per cent. of the total oil and contain the whole of the newly-formed oil. After releasing the pressure and eliminating water, the liquid is distilled to give three main fractions: benzine coming over up to 170° C., a medium oil boiling up to about 325° C., and, finally, a heavy oil. The latter is used as a grinding medium for a fresh batch of coal.

About 1,500 tons of coal were put through the plant without mishap during continuous working for three months, at the end of which time the apparatus was in perfect working order. About 20 to 21 tons of coal were treated daily under the optimum conditions and yielded 13 to 14 tons of oil.

Experience gained with this plant indicates that the cost of benzine by hydrogenation of anthracite should not be higher than that obtained by lignite hydrogenation. Motor spirit obtained by this process possesses satisfactory anti-knock qualities. It has an octane number of 66 to 68, which can be increased to 73 to 76 by the addition of 10 per cent. alcohol.

# Increased Uses for Lac

## Annual Report of the Officer for Lac Inquiry

ACCORDING to the annual report of the Special Officer for Lac Inquiry to the Indian Lac Cess Committee, for the financial year 1933-34, the consumption of lac products in 1933-34 throughout the world has been below normal with the exception of seedlac, which constituted a record.

In the varnish and polish industry considerable interest is being taken in cellulose lacquer in combination with dewaxed lacs for spraying and pad application, and this line of research is being pursued in the New York Shellac Research Bureau. Research is now in active progress to find new uses for lac products by means of a careful study of what "lac" is and what can be done with it by reason of its constitution.

With intensive lac research safely launched the future of lac is definitely bright, notwithstanding the progressive shrinkage in its use in the largest lac-consuming industry, namely, the gramophone record industry; this shrinkage is due, not so much to the incursion of competitive substitutes as to revolutionary changes in sound reproduction systems. Efforts in India to market lac products of high quality and reliable composition and in the distributing organisations to secure some measure of stability in price will add appreciably to the brightness of the outlook. For the competition of substitutes has come to stay, the invention of a synthetic shellac as against mere synthetic substitutes may become a reality any day, and, consequently, the future of shellac cannot be assured save at the cost of sleepless vigilance and close co-operation between producer, distributor and research worker. Without such co-operation the labour of the research worker will be of academic value only, the producer will always be in a state of uncertainty as to his markets, and the distributor will lose his most valuable asset, namely, the confidence and goodwill of the consuming industries.

The year's work has shown considerable activities and developments. In May, 1933, the laboratory of the Special Officer for Lac Inquiry was moved from Saundersfoot to the Paint Research Station, Teddington, and his office to India House, this arrangement being in preparation for the arrival of Indian lac research workers in England. The work of the Special Officer was concentrated on making the research policy of the Indian Lac Cess Committee known to scientific research bodies interested in lac and allied materials and to industries using lac or known as potential users of lac. Twenty specific inquiries relating to the use of natural lac for industrial purposes, and involving applied research in the laboratories, were dealt with during the year.

Of the methods so far experimented with to break down the lac, cataphoresis, molecular distillation and the bombarding of solid particles of lac with ozone or ozonised air, all have given useful pointers but none very definite results. Sufficient has been done, however, to throw doubt on the present accepted structural formula of lac in so far as the position of the interior "double-bond" is concerned. An important problem is the evolution of a commercially practicable process for separating off the ether-soluble shellac substance. The pure chemistry of shellac wax is still under investigation by Professor Chibnall. Commencing with its January-February, 1934, number, the "Paint Research Station Review of Literature" started a new section (No. 10) on shellac technical literature, and this section will provide a useful medium for reaching the public when lac research results are ripe for publication.

The filtration of wax from alkali solutions of lac, which contain 5 per cent. or so of the wax, in order to obtain wax-free transparent bleached products, and also the filtration of shellac wax generally has been a difficulty which the metafilter is likely to solve. Mechanical dryers are also of importance to the lac industry to dry seedlac and more especially granulated and powdered bleached lac. The latter normally contains 25 to 30 per cent. moisture and this has to be reduced to 6 per cent. in order to market the product as "bone-dry." In this state it retains its qualities of solubility in alcohol and its colour much better. Experiments are in progress with these dryers in co-operation with the makers. Passing bleached lac through heated rollers under considerable pressure also offers prospects of success.

The cost of the Special Officer Lac Inquiry work during the year was £892 as against £900 provided, and the total cost up to March 31, 1934, was £3,970, of which half is borne by the British Government.

# Notes and Reports from the Societies

## Alchemists Club

### Glasgow : Vat Dye Manufacture in Scotland

VAT dye manufacture in Scotland was entirely a post-war development, said Mr. R. Fraser Thompson in summarising the history of Scottish Dyes, Ltd., from their early operations at Carlisle to the commencement and extension of the Grangemouth factory, when speaking at the Alchemists Club, at Glasgow, on February 27. He also referred to a paper read to the Society of Dyers and Colourists at Glasgow on December 18, 1914, by the late Mr. R. D. Hendry, then a colourist at Patons and Baldwins, Alloa Works. In this paper Mr. Hendry outlined proposals for the formation of a Colour Users Association and for the erection of a colour works in Scotland, the most suitable for which he considered was at Grangemouth. The paper attracted no great attention at the time and did not come to the attention of the directors of Scottish Dyes, Ltd., until their Grangemouth factory was actually in course of erection. It is interesting to note that the scheme carefully thought out by the late Mr. Hendry both duly came to fruition. Mr. Hendry's deliberations are the more noteworthy in that they were made at such an early date, before any but a few had devoted time and attention to the subject of a native dye industry and its possible development.

## Society of Dyers and Colourists

### Scottish Section : Advances in Cellulose Derivatives

SPEAKING on "Recent Advances in Cellulose Derivatives" at a meeting of the Scottish Section of the Society of Dyers and Colourists at the Royal Technical College, Glasgow, on February 22, Dr. J. Craik, of Imperial Chemical Industries, Ltd., said that, apart from the industrial importance of the cellulose nitrates, cellulose acetates and products regenerated from viscose, little had been accomplished in the exploitation of other cellulose derivatives even as recently as 1920, and our knowledge of many of the newer products had been gained since that time.

The cellulose esters of the saturated series of the fatty acids had recently engaged the attention of many workers, and it was now possible to show a graduation in properties in this series of esters. Films grown from their solutions show a steady decrease in tensile strength and an increase in elongation from the acetate to the stearate. The softening points, on the other hand, indicate a marked decrease, being as low as 80° C. for a cellulose di-stearate, while the water resistance is greatest for the highest member of the series. In the unsaturated series, cellulose oleate is difficult to prepare in soluble form and cellulose crotonate gives a film of poor tensile strength.

Among the inorganic esters, cellulose nitrate is still the only ester of importance, although a good deal of work has recently been published on cellulose phosphate and more particularly on cellulose sulphate. These two derivatives are, for the most part, water-soluble. Much more progress has been made in the industrial development of the cellulose ethers, and methyl, ethyl and benzyl cellulose are now becoming well-known commercial products. The first is characterised by its solubility in cold and insolubility in hot water. Ethyl and benzyl cellulose are soluble in a wide range of organic solvents and can be used as the bases from which to prepare moulding materials, celluloid, films, various coating dopes, insulating compositions, lacquers and enamels.

Hydroxyethyl celluloses have recently received a good deal of attention and present a wide range of water- and alkali-soluble derivatives. The recent work of Schorger (B.P. 389,534) describes the manufacture of a product of low substitution, which gives good stable solutions by freezing in dilute sodium hydroxide solutions, or by alternative processes (I.C.I., B.P. 410,152 and 410,153). Other products of low substitution and similar solubility properties, for example, methyl cellulose and cellulose sulphate, have also received attention (I.C.I., B.P. 416,590 and 420,529). This type of product may find important outlets in the manufacture of transparent wrapping paper and artificial silk, or as permanent textile finishes and cloth fillers.

## Chemical Engineering Group

### Joint Meeting with Plastics Group

A JOINT meeting of the Chemical Engineering Group and the Plastics Group will be held on Friday, March 15, at 8 p.m., in the rooms of the Chemical Society, Burlington House, London, when a paper on "Plastics in a Chemical Works" will be read by Mr. M. B. Donald, F.I.C., M.I.Chem.E. This paper will deal with the chemical and mechanical properties affecting the selection of plastics in the construction of chemical plant and will form a valuable contribution to the growing technology of this subject. The chair will be taken by Dr. W. R. Ormandy, chairman of the Group.

## Chemical Society

### Liverpool : Solid Reactions and Explosive Decomposition

SOLID reactions occur on surfaces and very rarely in the interior of solids and the reactions commence at nuclei, the shapes of which are determined by the crystalline structure, said Professor W. E. Garner, in a paper on "Solid Reactions and Explosive Decomposition," read before the Chemical Society at Liverpool on February 27. For example, on the surface of copper sulphate, the nuclei are star-shaped with the two axes of the star parellel to two of the main crystal axes. There is a third direction of growth into the crystal making an angle of 56° to the (110) face. There is an induction period before any nuclei are visible under the microscope, but after the nuclei become visible they increase in number linearly with the time. During the induction period they grow very slowly at an accelerating rate, but from $10^{-3}$ cm. upwards they increase in size at a linear rate.

The rate of decomposition of solids is a function both of the rate of formation of the nuclei and the rate at which they grow. For exothermic reactions, which have been examined more completely than endothermic reactions, there is an induction period during which the rate of evolution of gas is very slow and this period is followed by an acceleration of the reaction. The acceleration obeys the laws of branching chain reactions, that is, the pressure increases according to the equation

$$\frac{dp}{dt} = \text{const. } e^{kt},$$

where $t$ is the time and $k$ a branching coefficient. This law is obeyed in the decomposition of mercury fulminate, potassium, barium and lead azides, and lead styphnate. The equation means that the nuclei in the early stages grow at a rate which is proportional to their mass. This is the most important condition responsible for the induction period in solid reactions.

The precise nature of the chain reactions which occur is uncertain. Whether or not they are analogous to that occurring in the oxidation of hydrocarbons, etc., where the same law holds, or whether the unit of the chain is a Smekal block must be left to future investigation to decide. In endothermic changes, for example, the decomposition of hydrates and carbonates, etc., the reactions are often reversible, and the rates are dependent on the speed of the back reaction. As Topley has shown, the adsorption of the gaseous product on the solid surface plays an important part in the rate of decomposition of such compounds.

Detonation can arise either on fracture of a crystal or during the thermal decomposition, or by methods which combine both of these, such as by friction or a falling weight. It may even occur on crystallisation. The decomposition of molecules singly rarely leads to detonation, and consequently even the most sensitive explosive can be decomposed completely without detonation occurring. Rapidly-moving projectiles of a size $10^{-13}$ cm., for example, electrons and α-particles do not cause detonation, although they bring about decomposition of the explosive. On the other hand, Kahlmann and Schrankler have succeeded in producing detonation with gaseous ions $10^{-8}$ cm. in diameter. From this it will be gathered that the volume of the disturbance which gives rise to detonation cannot be large. Muraour has suggested that

the cause of detonation is the simultaneous decomposition in the same region of a large number of molecules. This cannot be true of detonation arising out of thermal decomposition, for the probability that a large number of adjacent molecules will decompose within $10^{-13}$ sec. is negligibly small. For lead azide at 290° C., it can be calculated that the decomposition of *two* adjacent molecules simultaneously is an event of the same order of probability as that of detonation.

The critical increments of the thermal decomposition of explosives, like the heats of detonation, bear no simple relationship to the sensitivity of explosives, probably because the size of the detonation centre varies from case to case. Following up this line of argument the critical increment of the detonation process will be NE where N is the number of molecules composing a centre and E the activation energy required to decompose one molecule. N is difficult to determine experimentally and in only one case has as approximate value been derived. For lead azide at 290° it can be calculated from the temperature coefficient of the time lag before detonation that N = 4. From results by the falling weight method it is probable that N varies with temperature.

If detonation depends on the occurrence of an isolated event, then its occurrence should obey the laws of chance. Were the onset of detonation a purely thermal process, since this would depend on the behaviour of a large number of molecules, fluctuations in the lag before detonation would not be expected. Since such fluctuations are observed both in detonation arising out of thermal decomposition and in the falling weight method it is probable that detonation is not entirely dependent on thermal processes. The hypothesis that detonation arises at centres consisting of a *few* molecules decomposing simultaneously is in better accord with the facts as known at present.

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# Society of Chemical Industry

## Manchester Section

A MEETING of the Manchester Section of the Society of Chemical Industry was held at the Engineers' Club, Manchester, on March 1, when Dr. F. L. Pyman, F.R.S., director of research to Boots Pure Drug Co., Ltd., gave an address on "Chemotherapy," Dr. A. Schedler, the chairman of the section, presiding. Introducing his address with a brief account of the pioneer chemotherapeutical studies of Ehrlich and of the discovery of salvarsan, Dr. Pyman first discussed the chemical structure and therapeutic potency of arsenicals and bismuth compounds. He then dealt with the more recent work in the field of antiseptics, referring in particular to the investigations carried out on homologous series, and directing attention to the relationship between length of the side chain and antiseptic value. He also discussed recent advances in our knowledge of local anæsthetics, and concluded his address with an account of synthetic drugs possessing anti-malarial power.

## Glasgow Section : Education of the Chemist

THE annual business meeting of the Glasgow Section of the Society of Chemical Industry was held at the Royal Technical College, Glasgow, on March 1. Mr. Thomas Donaldson, chairman of the Section, presided, and the following officers were appointed for the coming year: Chairman, Mr. J. G. Roberts; vice-chairman, Mr. T. Donaldson; members of committee, Professor G. G. Henderson, Professor F. J. Wilson, and Mr. J. Simpson. Afterwards, a joint meeting with the Glasgow Section of the Institute of Chemistry was held, and Mr. Donaldson delivered his address on the "Education of the Technical Chemist."

Mr. Donaldson considered the position, under the present regime, of a young man leaving school and deciding to become a technical chemist. He said that, in nine cases out of ten, such a man was too young to arrive at a correct decision as to what course he should take, and in many cases the difficulty of retracting once his decision had been made was considerable. If he continued and took an honours degree he would probably pursue research leading to a doctorate, and then at 24-25 years of age would endeavour to secure an industrial position. His seven years' training would scarcely have touched industrial chemistry and it would require another two years' training in industry before he could be regarded as a thoroughly useful member of his profession. Thus, nine years would have been spent in training and this, in Mr. Donaldson's opinion, was much too long. As an alternative, he suggested that a young student should aim at a pass degree requiring three years' study. Then a decision could be made as to whether he would pursue a technical career or go into commerce as a technical salesman. If he decided on a technical career he could either complete his honours degree and take one year's post-graduate research or he could take a two years' course in applied chemistry. Every works chemist need not be a research man. One criticism of his proposed course of training was that it might produce a chemist with a smattering of many subjects. Such a man would certainly not have a profound knowledge of chemistry as such, but he would have a firm grasp of the fundamentals and would be in possession of a useful general knowledge which a highly qualified chemist did not possess.

He considered the long vacation of the Scottish Universities was too protracted, and in this respect chemical industry could lend a hand by arranging vacation courses. A number of firms, including Imperial Chemical Industries, Ltd., had established such courses, and students obtained an insight into departmental organisation, costing methods, labour utilisation and general office work. Before the war, only large firms employed chemists, but nowadays practically every firm associated directly or indirectly with chemical industry boasted at least one chemist. The demand for well-trained men was now keeping pace with the supply, and young men, if their inclinations lay that way, could consider with confidence that their prospects were in every way as good as, if not better than, those of their fellow students whose choice might lie in other directions.

## Birmingham Section : Plastics Based on Rubber

PLASTICS based on rubber, with special reference to "Rubbone," was the subject of a paper which Dr. W. H. Stevens read before the Birmingham Section of the Society of Chemical Industry on February 26.

The principal uses for natural rubber are based on its unique physical properties. Only comparatively recently have attempts been made to utilise rubber as a raw material for the production of chemical derivatives with useful properties; particularly for application in the "plastics" and allied industries. All the derivatives so far prepared from rubber are thermoplastic in character and their applications are essentially those utilising this property whether for moulding or other purposes. A different and somewhat unexpected application for such a thermoplastic derivative (rubber tin halide) is that of thin sheet wrapping material which has a 20 per cent. greater area for a given weight than the well-known cellulose materials. This material also has the advantage that it can be readily sealed, *e.g.*, with a hot iron, thus facilitating wrapping. Other derivatives of rubber, such as the chlorinated and sulphonated compounds, are also well known and find special applications.

The oxidation of rubber is a reaction of very great importance to the rubber industry owing to its deterious effect on the physical properties, particularly the elasticity and tensile strength of vulcanised rubber. It has therefore been usual to avoid the oxidation of rubber by all possible means where these ("rubbery") qualities are desirable in the finished article. Recently it has been found, however, that catalytically oxidised rubber, made under controlled conditions, may prove a useful material for certain purposes, such as resin bonded mouldings, electrical insulating varnishes, paints and lacquers, adhesives, and as starting materials for further chemical treatment, *e.g.*, halogenation.

Thus, it has been shown (Stevens and associates, "Bulletin, Rubber Growers' Association," 1933, *15*, 600; B.P. 407,038) that by the catalytic oxidation of rubber solutions of greatly reduced viscosity can be obtained and that these have desirable effects when incorporated in paints and varnishes. A further study of this catalytic oxidation has resulted in the production of resins of interesting properties (B.P. 417,192) which have been named Rubbone. The applications of Rubbone result from its resinous and reactive characteristics. Rubbone "B" ($C_{10}H_{16}O$) can be utilised in conjunction with known varnish and lacquer resins, or, in replacement thereof, being compatible with both polar and non-polar solvents. It is especially useful for electrical insulation, where impregnation by a varnish medium is the normal process, because Rubbone can be rendered liquid by heating for the impregnation process, if desired without the use of solvent, and on stoving the resin thermosets to an elastic polymer. At the same time, Rubbone is a "drying

resin" and the surface in contact with air during stoving oxidises and "case-hardens." Rubbone can also be vulcanised by sulphur or sulphur chloride in the normal way. Cold cured or halogenated films are elastic but perfectly clear, do not absorb moisture, and are believed to be impermeable to gases (in contradistinction to soft vulcanised rubber, *e.g.*, tennis balls, or rubber proofed fabrics, *e.g.*, airship fabric).

# Institute of Fuel

## Boiler Practice in Government Departments

IN a paper by A. C. Pallot read before the Institute of Fuel at Burlington House, London, on February 27 it was explained that to determine the best types of fuel for use in the various boiler plants under the control of H.M. Office of Works, a number of tests were made with bituminous fuels and also with various grades of anthracite. It is frequently difficult to obtain an ultimate analysis of a particular fuel, although this information is necessary before the combustion characteristics can be determined. A comparison was therefore made between the proximate and the known ultimate analyses of a large number of fuels, and it appeared that in the great majority of cases the total carbon, the hydrogen and the oxygen bore definite relationships to the "fixed carbon" content of dry, ash-free coal, or to the "fixed carbon"/volatile ratio: the latter is constant whether the fuel is considered "as received," dry, or dry and ash-free. Sulphur appeared to be quite adventitious, but in most cases the quantity of sulphur present has a negligible effect on combustion efficiency, although it may still be important as regards the discharge of acid gases from the chimney.

On the first installation of forced-draught furnaces, tests were carried out with a number of bituminous slacks and small coals. Some of these gave very good combustion efficiencies, while others proved unsuitable for various reasons. With nearly all, however, the smoke emission was serious. Lancashire and economic types of boilers are generally better than those of water-tube type as regards smoke. Various expedients were tried, such as special smoke-consuming bridges, the injection of secondary air above the fire, and the admission of diluting air to the chimney, but none gave entirely satisfactory results.

In the summer of 1933 the possibilities of Scotch anthracite smalls were investigated. Large supplies were available, and, being water-borne, it could compete favourably with other types of fuel in London. Attempts were at first made to burn the Scotch anthracite alone, but in the form of "duff" (or the Scottish equivalent "gum") fires could not be maintained, and for heavy loads the grain size did not prove satisfactory, as the combustion efficiency rapidly deteriorated when the fires became dirty and frequent cleaning with a consequent loss of heat (and of steam pressure) was necessary. Experiments were therefore made with various mixtures of Kent smalls and Scotch anthracite, particularly in the duff size on account of the lower cost. The efficiency of several plants fell somewhat, but there was some reduction in overall costs. As regards smoke, the effect of the Scotch anthracite was to reduce the peaks due to the bituminous fuel, but to render the emissions of longer duration. The results quoted showed the very considerable savings which invariably accrue from the systematic investigation of boiler operation, and it was anticipated that, for the present year, the cost of fuel for buildings in the London area, as compared with the cost of 1931-32, would be lower by approximately £10,000.

# Low Temperature Carbonisation

## Official Test of British Coal Distillation Plant

THE results of a test carried out on the low-temperature carbonisation plant of British Coal Distillation Ltd., at Newbold, Leicestershire, are given in a Fuel Research Report issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 9d. net).

A previous test on this particular plant was carried out in November, 1930, but was not completely satisfactory, chiefly owing to lack of continuity in the operation of the retort, caused by mechanical difficulties in the coal charging plant and in the plant dealing with the separation of the coke.

The process involved is an interesting one. The retort is described in the account of the present test as consisting of a rotating tube 90 ft. long and 9 ft. in diameter, inclined at an angle of 1 in 20 to the horizontal. It forms a shell, inside which are seven smaller tubes through which the coal passes from the higher end to the lower, emerging when carbonised through special valves in the outer shell. Circulating gases provide the heat for carbonisation. Producer gas is burnt in a special combustion chamber, and the resulting hot burnt gas is passed up through the retort, driving off and mixing with the gases and vapours from the coal. On leaving the retort, these gases are stripped of tar, liquor and dust and, having a low but appreciable calorific value, re-enter the circulation at the special combustion chamber, a certain proportion, for control purposes, being allowed to escape to atmosphere.

The coal carbonised is cheap slack, and the solid products are separated in water into clean coke and "dirt." The former is subsequently compressed into briquettes and the latter is used for steam generating in the plant.

The retort is claimed to be capable of carbonising 100 tons of slack coal per day and during the test—which occupied five days—the throughput was 97 tons per day, no difficulty being experienced with the retort mechanism. The apparatus for the separation of clean coke from "dirt" was, however, inadequate at the full retort capacity, but a general description is given of the additional plant that would be necessary to remove this inadequacy and complete the process from the carbonising stage to the production of smokeless domestic fuel.

Weight, hydrogen and carbon balances show that the yields given can be taken as correct, a somewhat large loss of carbon being partly explained by loss of fine coke dust which could be remedied. The heat supplied for carbonisation was 17.5 therms per ton of coal as charged and this can be considered as a very satisfactory figure. An addendum to the report gives technical data on the domestic fuel produced, including combustibility tests.

# Personal Notes

DR. JOHN ALEXANDER MILROY, who died on September 19, left £5,894.

MR. JAMES WATSON REOCH, London secretary of Scottish Oils, Ltd., died on February 26.

MR. ARTHUR GILLIAT, of Leeds, of E. G. Jepson and Co., who died on January 15, left £24,835.

MR. R. S. BROWN, Mr. C. A. Klein and Mr. J. L. McConnell have been appointed directors of Goodlass Wall and Lead Industries, Ltd.

MR. CHRISTOPHER GEORGE, the chairman of Bristol Brewery Georges and Co., Ltd., was re-elected president of the Institute of Brewing for the ensuing year on March 1.

MR. JOHN CAMPBELL has resigned his position as assistant secretary to the Armstrong Whitworth Companies, and has been appointed secretary to Herbert Green and Co., Ltd., Thames House, London.

MR. CHARLES FREDERICK THACKRAY, of Roundhay, Leeds, pharmaceutical chemist and surgical instrument maker, of Leeds, who died on December 9, aged 57, left £57,498, with net personalty £53,994.

DR. WALTER HAWORTH, Professor of Chemistry at Birmingham University, has been appointed a corresponding member of the Mathematical-Scientific Department of the Bavarian Academy of Sciences.

## Methanol in Japan

PRODUCTION of synthetic methanol in Japan has progressed so rapidly during the past year that the leading producers, the Nippon Gosei Kogyo, the Nippon Methanol K.K. and the Nippon Chisso Hiryo K.K. have recently requested the Japanese Government to impose an import duty on this product to protect the industry. Imports of methanol from the United States and Germany have already been affected by the increased domestic production, the imports for the first nine months of 1934 amounting to 21,246 metric tons, compared with 34,263 metric tons during the corresponding period of 1933.

# British Industries Fair, 1935

## Exhibitors' General Satisfaction

THE British Industries Fair, 1935, which was held on a record scale and which closed on March 1, proved, if the economic conditions prevailing in the world are taken into consideration, one of the most successful by far of the Fairs held since the first British Industries Fair in 1915. The attendance of buyers broke all records for the Fair. General satisfaction with the results achieved were expressed by the majority of the exhibitors.

Both the chemicals and druggists' sundries sections report an improvement compared with 1934. Large orders for chemicals are seldom placed at the Fair, but the sections received this year a larger volume of serious inquiries—and particularly from abroad—than was the case a year ago. The majority of the exhibitors are satisfied with the visits which they received from old customers and the inquiries which they received from potential customers. Favourable reports have been received from exhibitors in the plastics section.

So far as the scientific instruments section was concerned, the Fair fulfilled all expectations. Inquiries and contacts were numerous and of the type desired, and the exhibitors generally appeared to be well satisfied. In this section a large number of orders at the Fair itself is not expected and the Fair is looked upon more as a medium for pubicity and propaganda generally.

Despite the fact that the engineering and hardware section of the Fair was not held this year simultaneously with the Fair in London, but is to be held at Castle Bromwich in May next, the attendance of overseas buyers at the Fair in London alone nearly reached the attendance of overseas buyers at both sections of the Fair last year, whilst there was an increase in the attendance of home buyers.

# Lubrication Research

## Boundary Value of Oils of Different Origin

SOME of the difficulties of deducing the properties of a lubricating oil from tests on a bulk sample of the oil are brought out in a technical paper issued by the Department of Scientific and Industrial Research (A Study of the Boundary Lubricating Value of Mineral Oils of Different Origin, by Miss M. E. Nottage, H.M. Stationery Office, 9d. net). The report deals with the conditions such as exist just before seizing between moving parts takes place when the film of lubricating oil between two smooth bearing surfaces is so thin that the molecules on the outermost layer of one surface are within the range of the cohesive forces due to the outermost molecules on the other surface. Such conditions, which are known as boundary conditions, become important when starting or stopping an engine. When they are present the friction, it is stated, may be as much as 100 times as great as when the surfaces are separated by a fairly thick film of oil.

The report points out that there is much experimental evidence to show that a solid surface can produce considerable modifications in the properties of a layer of liquid in contact with it. For instance, it can selectively pick out certain constituents from a mixture such as an oil and concentrate them in the surface layer. Hence the properties of this layer, for example, the effect of heat upon it, may be quite different from the properties of the oil in bulk. Although in the course of preparation the oils used in the experiments have been distilled at high temperatures and were thus presumably in a state of chemical equilibrium, yet experiments described in the report show that a rise of temperature of the oil of, say, 18-30° C., when it occurs in the presence of an adsorbing surface, may be accompanied by a considerable amount of chemical activity in the boundary layer. Such properties of the layer cannot be predicted from a knowledge of the behaviour of the oil in bulk, but it is just these properties which become all-important when, owing to the thinning of the oil film, which precedes seizure of the bearing surfaces, boundary conditions arise. Another point revealed by the investigations described is that of the rôle of wax in mineral oils. It is shown that wax, the presence of which in an oil is generally regarded as detrimental, as far as fluid lubrication is concerned, may in certain cases exert a beneficial effect when boundary conditions arise.

In the experiments a number of commercial mineral oils obtained from as many sources as possible has been examined. In the apparatus used, which is similar to that developed for earlier experiments by the late Sir William Hardy, optically polished spherical sliders, shaped like inverted mushrooms, are drawn by threads attached to their stems over polished metal plates. The sliders and plates after being scrupulously cleaned are enclosed in chambers consisting of small steel cylinders which can be electrically heated. A drop of the oil to be tested is placed on a plate and is spread by the moving slider until the oil surface is reduced to the required thinness. The report states that Hardy showed that in this way it is possible to cut through a thick film of lubricant until a layer only two molecules thick remains between the surfaces. The force which must be applied to a thread so as just to move the slider is then determined and the coefficient of friction thus found. The temperature of the chamber is then varied and the experiments repeated. In most of the work described the bearing surfaces were of steel themselves, but a few experiments were carried out in which silver-alloy surfaces were used. In these cases it is shown that the attractive forces are more intense than with steel surfaces.

# Transparent Synthetic Resin

## New I.C.I. Product at British Industries Fair

THE new I.C.I. synthetic resin was exhibited in an entirely new form on the stand of Mouldrite, Ltd., in the Plastics Section of the British Industries Fair. As a granular thermoplastic moulding powder it has received the name of "Leukon." It will be remembered that this new resin was first shown in its solid form at the Royal Academy Exhibition of British Art in Industry.

Leukon is capable of treatment by either compression or injection moulding. These processes involve treating the material under the influence of temperatures around 140° C., and at high pressures render possible the mass production of complete articles in desired shapes, with great economy of time and effort by the elimination of intermediary machining operations.

The density of the material is about 1.2 at 20° C., 10 per cent. less than ordinary phenol formaldehyde bakelite types of moulding powders, and 20 per cent. less than the amino types of moulding powders, such as Beetle, Polopas, etc., and about 1/7th of the weight of copper or brass. It is insoluble in water, alcohol and aqueous media; unaffected by acids or alkalis up to concentrations of 40 per cent. in the case of sulphuric acid and of caustic soda at atmospheric temperatures; unaffected by many high-boiling organic esters, but soluble in certain of its forms in a number of organic solvents, which include acetone, chlorinated hydrocarbons and benzene.

It can be cut easily and takes and retains the sharpest impression of the tools. If heated to 120-140° C. the material may be stamped with a die to give a perfectly sharp impression, which does not subsequently flow back and lose its sharpness. By working it at a temperature around 140° C. it has also been possible to employ a form of technique of spinning as applied to metals.

The chemical stability of Leukon and its good mechanical strength, taken in conjunction with the wide range of colour effects and the ease with which it can be moulded, make it very suitable for employment in the manufacture of articles or parts used in the cosmetic trades, such as containers, enclosures, etc. In this direction its light weight is also of considerable advantage. It is equally suitable for tobacconists' sundries, where it makes possible the production of more hygienic and attractive pipe-stems, more moisture-resistant tobacco jars and cigarette boxes, or lighter-weight cigarette cases. In the electrical industries it should be used for the production of small electrical bobbins, coil formers and other small parts where high dielectric qualities are required.

BASIC phosphate slag consumption in Netherlands during the year ended March 31, 1934, was estimated at 250,000 metric tons, as compared with 172,000 tons for the previous fiscal year. It is reported that a large share of the Russian superphosphate imported into the Netherlands remains unsold in warehouses, mainly at Terneuzen.

# News from the Allied Industries

### Beet Sugar

Returns from the 17 beet sugar factories in England and Wales show that the average sugar content of roots during the 1934-35 season was 17.1 per cent., as compared with 16.4 per cent. in 1933-34.

### Asbestos Cement

TURNER AND NEWALL, LTD., and the Aberthaw and Bristol Channel Portland Cement Co., Ltd., announce that an agreement has been concluded for the sale to Turner and Newall, Ltd., of the asbestos-cement factory belonging to the Aberthaw and Bristol Channel Portland Cement Co., Ltd., situate at Rhoose, near Cardiff. The Aberthaw Company at present owns both the Portland cement works and the adjoining asbestos-cement factory at Rhoose, but it is only the latter which is included in the sale.

### Artificial Silk

A DRASTIC SCHEME OF CAPITAL RECONSTRUCTION is proposed by the Branston Artificial Silk Co. Under the scheme the capital will be reduced from £1,400,000 to £215,000 by cutting down the nominal value of each issued ordinary share from £1 to 4s., and that of each issued deferred share from 4s. to 2d. The 200,000 unissued deferred shares will be cancelled. On the reduction taking effect, every twenty-four of the deferred shares will be consolidated into one deferred share of 4s. The ordinary and deferred shares will then be converted into one uniform class of 1,075,000 ordinary shares of 4s. each. In order to save capital duty the authorised capital of the company will be increased to the former amount of £1,400,000 by the creation of 5,925,000 new ordinary 4s. shares.

### Linoleum

LES ETABLISSEMENTS MARECHAL, S.A., the French oilcloth manufacturing company, which controls Maréchal, Ltd., proposes another capital reorganisation. It is proposed to write off three-quarters of the present nominal value of the shares to Frs.100 (making a loss to shareholders, including the previous reduction, of four-fifths of the capital originally subscribed). Holders of the founders' shares are asked for the cancellation of four-fifths of their rights by the reduction of their percentage of the profits from 25 per cent. to 5 per cent. From the debenture-holders there is demanded a reduction of interest from 5½ per cent. semi-net to 5 per cent. gross. The capital, after being reduced to 25,000,000 francs, will be increased by 10,000,000 francs by the issue of 100,000 shares of 100 francs. It is proposed to issue these for cash.

### Non-Ferrous Metals

TO KEEP PACE WITH THE DEMAND for nickel, which is substantially greater than at this time last year, the International Nickel Co. of Canada, Ltd., has provided for an increased volume of production in mines and metallurgical plants of the company. Two spare reverberatory furnaces have been placed in operation at the Copper cliff smelter, and the output at the Frood mine has been increased by approximately 30,000 tons monthly. At the Port Colborne, nickel refinery, an additional electrolytic unit has been started, which will produce approximately 800,000 lb. additional metal per month. In addition, the four new converters and blowing equipment forecast in the company's annual report for 1933, construction of which was started early in 1934, have been completed and are ready for operation.

# Continental Chemical Notes

### France

A RE-EXAMINATION OF THE CLAIMS advanced for the efficiency of the nitroglycerine-nitropentaerythritol explosive, introduced some years ago by Stettbacher, has led D. Bardan ("Chimie et Industrie," February, 1935) to the conclusion that the extreme sensitivity of this explosive, apart from its high price (about 1½ times that of trinitrotoluene), will seriously limit its use in warfare. Incidentally, the author gives detailed instructions for the preparation of pentaerythritol itself and its nitration to the tetranitro-derivatives (Penthrinite).

### Russia

IMPROVED YIELDS OF ALKALI METAL PERMANGANATES have been obtained by adding up to 10 grams anhydrous manganate to the saturated solution of permanganate before crystalliisation (Russian Pat. 35,145).

TO MAKE COLLOIDAL SULPHUR it is proposed to treat potassium polysulphide solution with potassium tartrate in quantity equivalent to the metallic iron in presence of gelose (a protective colloid). Precipitated potassium tartrate is filtered off, the liquid neutralised with lime and, finally, after a second filtration, evaporated in vacuo (Russian Pat. 31,420).

### Sweden

OPTIMISTIC REPORTS HAVE APPEARED in the Swedish press concerning a new process for extracting a vitamin-rich oil from herrings. Following experimental work extending over three years the results obtained are stated to have justified the erection of a factory which will commence working at the beginning of the trawling season. The new process, which may solve the problem of utilisation of surplus herrings, will be run in conjunction with fish meal manufacture, 15 tons of fish meal accumulating during manufacture of 2 tons of the vitamin-rich oil. Owing to the high percentage of vitamin D present in the herring fish oil, which also contains vitamin A, this oil may form a substitute for fish liver oil.

### Italy

EXAMINATION OF VISCOSE FABRICS damaged by insects suggests that rayon is liable to attack by two groups of insects consuming respectively albumen and cellulose. The former group does not destroy the rayon for assimilative purposes, but uses it as a protective material for the larvæ.

### Germany

RUBIDIUM SALTS, including the carbonate, chloride, bromide and iodide are now being made in a high state of purity by the Salz- und Chemikaliengesellschaft of Magdeburg.

CELLULOSE ACETATE BOTTLE CAPS comparing favourably with viscose caps, owing to the superior rate of drying and contracting, are prepared from solutions containing a water-miscible solvent (*e.g.*, acetin) which are extruded into a bath containing water or an aqueous solution. The acetate caps also lend themselves to attractive pigmentation with metallic pigments ("Chemiker-Zeitung," February 27).

CHROMIUM PLATING BATHS can be operated at the ordinary temperature, according to F. Assmann ("Chemiker-Zeitung," February 27), if a small percentage of fluoride is present. Lustrous chromium deposits on nickelled brass were obtained from a bath kept at a temperature of 18 to 20° C. containing 350 grams chromic acid and 3 grams potassium fluoride to each litre of water, and operated at a constant tension of 3.8 to 4 volts with a distance of 12 centimetres between the electrodes.

### National Physical Laboratory

PAPERS published by the staff of the National Physical Laboratory during February include "Crystal orientation in tooth enamel." By J. Thewlis, M.Sc. "Philosophical Magazine," *19*, 291. "Studies on the oxidation of metals. Part I." By G. D. Preston, B.A., and L. L. Bircumshaw, M.A., D.Sc. "Philosophical Magazine," *19*, 160. "The setting of dental amalgams. Part III." By Miss M. L. V. Gayler, D.Sc. "British Dental Journal," *58*, 145.

# Inventions in the Chemical Industry

## Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Complete Specifications Open to Public Inspection

PRECIPITATION OF MATERIALS from colloidal solutions.—Kodak, Ltd. Aug. 22, 1933. 21418/34.

SULPHURISED DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Aug. 19, 1933. 23536/34.

ANTI-HALATION LAYERS and filter layers for photographic purposes, manufacture.—I. G. Farbenindustrie. Aug. 19, 1933. 23649/34.

SULPHURISED DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Aug. 23, 1933. 23875/34.

GELATINE-RELIEFS for imbibition printing, manufacture.—I. G. Farbenindustrie. Aug. 19, 1933. 23981/34.

SULPHURIC ACID DERIVATIVES of alkylamines of high molecular weight, manufacture.—Deutsche Hydrierwerke A.-G. Aug. 19, 1933. 24027/34.

ALKALI METAL TITANATES, manufacture.—Titanges. Aug. 22, 1933. 24129/34.

PIGMENTED COATING COMPOSITIONS.—E. I. du Pont de Nemours and Co. Aug. 23, 1933. 24371/34.

VULCANISATION OF RUBBER.—E. I. du Pont de Nemours and Co. Aug. 23, 1933. 24372/34.

CELLULOSIC PIGMENTS, production.—E. I. du Pont de Nemours and Co. Aug. 24, 1933. 24446/34.

FERTILISERS, manufacture.—Research Trust, Ltd. Aug. 24, 1933. 24464/34.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Aug. 24, 1933. 24486/34.

### Specifications Accepted with Dates of Application

WATERPROOFING LEATHER.—Imperial Chemical Industries, Ltd., G. S. J. White, and H. A. Piggott. May 13, 1933. 424,410.

CYANINE TYPE, production of compounds.—J. D. Kendall. May 18, 1933. 424,559.

RUBBER DERIVATIVES.—Rubber Producers' Research Association, P. Schidrowitz and C. A. Redfarn. May 24, 1933. 424,561.

TREATING GASES WITH LIQUIDS, apparatus.—W. Learmonth and Imperial Chemical Industries, Ltd. June 21, 1933. 424,414.

PHOTOGRAPHIC DYESTUFF IMAGES, method of producing.—Dr. B. Gaspar. June 23, 1932. 424,563.

FERTILISERS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). July 17, 1933. 424,260.

AZO DYESTUFFS suitable for dyeing leather, manufacture.—Dr. R. Schuloff. Aug. 10, 1932. 424,262.

LUBRICATING OILS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 11, 1933. 424,569.

TRICARBOCYANINE DYES, production.—J. D. Kendall. Aug. 12, 1933. 424,264.

HIGHLY-NITROGENOUS MASHES, production.—Delta Technische Verkehrs A.-G. Sept. 8, 1932. 424,424.

SODIUM DICHROMATE, process for the manufacture.—I. G. Farbenindustrie. Sept. 17, 1932. 424,281.

SOAP MANUFACTURE.—E. I. du Pont de Nemours and Co. Aug. 18, 1932. 424,283.

ETHYL ACETATE FROM ETHYL ALCOHOL, catalytic manufacture.—E. I. du Pont de Nemours and Co. Aug. 18, 1932. 424,284.

FUNGICIDAL AND INSECTICIDAL MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 2, 1932. 424,572.

ALIPHATIC ANHYDRIDES, manufacture.—H. Dreyfus. Aug. 23, 1933. 424,573.

VAT AND SULPHUR DYESTUFF PREPARATIONS for textile printing.—I.G. Farbenindustrie. Aug. 26, 1932. 424,588.

1-(3$^1$, 4$^1$, 5$^1$-TRIALKOXYPHENYL) -6, 7-DIALKOXYISOQUINOLINES, production.—Asta Akt.-Ges. Chemische Fabrik. Aug. 29, 1932. 424,348.

CONDENSATION PRODUCTS from alcohols and phenols, manufacture.—British Industrial Solvents, Ltd., and H. Langwell. Oct. 5, 1933. 424,506.

MONO-AZODYESTUFFS, manufacture.—I. G. Farbenindustrie. Oct. 13, 1932. 424,354.

MONO-AZODYESTUFFS, manufacture.—I. G. Farbenindustrie. April 8, 1933. 424,355.

SOAP SUBSTITUTES.—Henkel and Cie, Ges. Dec. 16, 1932. 424,596.

MONOAZO DYESTUFFS insoluble in water, manufacture.—J. R. Geigy A.-G. Nov. 28, 1932. 424,365.

CONDENSATION OF VINYL ALCOHOL, production of articles.—Kodak, Ltd. Jan. 11, 1933. 424,372.

VALUABLE LIQUID HYDROCARBONS by the heat-treatment of liquid hydrocarbons containing unsaturated compounds in the presence of hydrogenating gases, production.—International Hydrogenation Patents Co., Ltd. Jan. 13, 1933. 424,531.

PLASTER-OF-PARIS COMPOSITIONS.—Gotham Co., Ltd., and C. L. Haddon. Feb. 15, 1934. 424,302.

MONOAZO DYESTUFFS, manufacture.—Chemical Works, Formerly Sandoz. March 7, 1933. 424,453.

LUBRICANTS AND LUBRICATING.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 4, 1933. 424,380.

POTASSIUM NITRATE from sodium nitrate, production.—Kali-Forschungs-Anstalt Ges. May 31, 1933. 424,308.

SYNTHETIC RESINS, manufacture.—Soc. of Chemical Industry in Basle. March 29, 1933. 424,536.

PLASTIC MASSES CONTAINING RUBBER, manufacture.—Soc. Italiana Pirelli. April 14, 1933. 424,312.

COLOURED CELLULOSE-ESTER MATERIAL, process for manufacturing.—H. Dosne. July 1, 1933. 424,398.

HETEROCYCLIC AMINO COMPOUNDS, manufacture.—A. Carpmael (I. G. Farbenindustrie). July 23, 1934. 424,476.

POZZOLANA CEMENTS, manufacture.—H. Wagner. Oct. 23, 1933. 424,614.

### Applications for Patents

**(February 21 to 27 inclusive).**

CRYSTALLISED AMMONIUM NITRATE, etc., production.—Bamag-Meguin A.-G. (Germany, Feb. 24, '34.) 5625.

PRODUCTS FROM HYDROCARBONS, manufacture.—A. E. C. Bennett. 6168.

AMINOSULPHONIC ACIDS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 5995.

TRISAZODYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie. 5996.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 5997, 6148.

PIGMENTS CONTAINING TITANIUM, manufacture.—A. Carpmael (I. G. Farbenindustrie). 6149.

GLASS, manufacture.—Chemische Fabrik J. A. Benckiser Ges., and F. Braisbach. (Germany, Feb. 21, '34.) 5651.

TRI-ALKYL ESTERS of phosphoric acid, production.—Consortium für Elektrochemische Industrie Ges. (Germany, April 18, '34.) 5670.

SELENOETHERS OF BENZANTHRONE, etc., series, manufacture.—E. I. due Pont de Nemours and Co. and M. A. Perkins. 6025, 6026, 6027, 6028.

ESTERS OF ALIPHATIC SERIES, manufacture.—E. I. du Pont de Nemours and Co. and H. J. Barrett. 6165.

REFINED HYDROCARBONS, etc. manufacturing.—H. D. Elkington. 5777.

NITRIC COMPOUNDS of substituted benzotrifluorides, manufacture.—W. W. Groves (I. G. Farbenindustrie). 5602.

ORGANIC COMPOUNDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 5854.

CARRYING OUT CHEMICAL, ETC., PROCESSES.—W. W. Groves (I. G. Farbenindustrie). 5961.

HIGH-MOLECULAR PRODUCTS CONTAINING SULPHUR, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 21, '34.) 5634.

MONOAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 24, '34.) 5885.

FLUORINATED ORGANIC COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 24, '34.) 5956.

CARRYING OUT CHEMICAL, ETC., PROCESSES.—I. G. Farbenindustrie. (Germany, Feb. 24, '34.) 5957, 5958. (Germany, Sept. 26, '34.) 5959. (Germany, Feb. 2.) 5960.

ORGANIC COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 26, '34.) 6150.

SOLUTIONS OF LIQUID ANTHELMINTICS, manufacture.—I. G. Farbenindustrie. (Oct. 25, '33.) (Germany, Oct. 25, '32.) 6265.

BITUMINOUS ROAD MATERIAL, etc.—R. Illemann. 5856.

VITAMIN-CONTAINING OILS, etc., treatment.—Imperial Chemical Industries, Ltd., H. T. Waterman and C. van Vlodrup. 5656.

VAT DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and M. Wyler. 5742.

DERIVATIVES OF PARAFFIN WAX, manufacture.—Imperial Chemical Industries, Ltd., C. Ockrent and W. Bennett. 6166.

COMPOUNDS OF HALOGENATED HYDROCARBONS, manufacture.—Imperial Chemical Industries, Ltd., C. Ockrent and P. W. F. Hardie. 6167.

PRODUCTS FROM HYDROCARBONS, manufacture.—Imperial Chemical Industries, Ltd., and C. Ockrent. 6168.

CHLORINATED PARAFFIN WAXES, manufacture.—Imperial Chemical Industries, Ltd. 6169.

PREPARATIONS of 6-methyl-amino-2-methyl-2-heptene, production. Knoll Akt.-Ges. Chemische Fabriken. (Germany, April 27, '34.) 5657.

# Weekly Prices of British Chemical Products

## Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products section, however, there has been an all-round reduction in benzol prices. There has also been a change in the price of iron ammonium citrate (green) in the pharmaceutical section, the new price being from 1s. 10d. to 2s. 8d. per lb. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—The chemical market has received a fairly satisfactory volume of business and inquiries are increasing. Prices in practically all sections continue firm and unchanged. Conditions in the coal tar products market remain the same as last week.

MANCHESTER.—General trading conditions on the Manchester chemical market are slow to display much actual change. During the past week traders state that whilst there have been a few additions to contracts already on their books, mainly for delivery over the next two or three months, both the number and the quantities involved have been relatively small. The bulk of the new orders have covered small parcels for delivery during the current month. There has been a fair numbr of specifications for delivery against contracts during March, and, on the whole, whilst there is still room for improvement, the quantities are reasonably satisfactory in the aggregate. A few easy spots persist, but prices are mostly very steady, except, as before, in one or two sections of the by-products market. Tar and pitch have been in quiet demand this week, with a steady inquiry about for carbolic acid and creosote oil.

SCOTLAND.—Business shows a slight sign of improvement in the Scottish heavy chemical market.

### General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 2½%. MANCHESTER: 11¾d. to 1s.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. to 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. for delivery up to June 30.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10½d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23. SCOTLAND: £20.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous. 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb.

with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.

## Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. to 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3¼d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 6d. to 8s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

## Latest Oil Prices

LONDON, March 6.—LINSEED OIL was steady. Spot, £23 (small lots 30s. extra); March and April, £21 7s. 6d.; May-Aug., £21 12s. 6d.; Sept.-Dec., £22 2s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), March-April shipment, £24 per ton. RAPE OIL was quiet. Crude, extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £27 10s.; refined common edible, £32; deodorised, £33 10s., naked, ex mill (small quantities 30s. extra). TURPENTINE was steady. American, spot, 49s. per cwt.

HULL.—LINSEED OIL, spot, quoted £22 2s. 6d. a ton; March and April, £21 12s. 6d.; May-Aug., £21 15s.; Sept.-Dec., £22 2s. 6d. COTTON OIL, Egyptian, crude, spot, £28; edible, refined, spot, £30 10s.; technical, spot, £30 10s.; deodorised, £32 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £21, naked. GROUNDNUT OIL, extracted, spot, £33 10s.; deodorised, £36 10s. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £28 10s.; deodorised, £31 10s. a ton. CASTOR OIL, pharmaceutical, 40s. 6d. per cwt.; firsts, 35s. 6d.; seconds, 32s. 6d. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. TURPENTINE, American, spot, 51s. per cwt.

# Forthcoming Events

### LONDON

**Mar. 11.**—Institution of the Rubber Industry (London Section). Two short papers to be read by members of the staff of the Research Association and the Northern Polytechnic. 12 St. James's Square, London, S.W.1.

**Mar. 11.**—Royal Society of Arts. "Factory Accidents—Measures for their Prevention." Leonard Ward. 8 p.m. John Street, Adelphi, London.

**Mar. 12.**—Institution of Petroleum Technologists. Annual general meeting. 5.30 p.m. Royal Society of Arts, John Street, Adelphi, London.

**Mar. 13.**—Institute of Fuel. "Explosion Flames Analysed by High Speed Photography and Illustrated by Experiments." Professor W. A. Bone and R. P. Fraser. 6 p.m. Burlington House, Piccadilly, London.

**Mar. 13.**—Electrodepositors' Technical Society. "Electrodeposition of Cadmium in Electrical Engineering." H. Marston. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

**Mar. 13.**—Royal Society of Arts. "Properties, Characteristics and Uses of Stainless Steel." S. A. Main. 8 p.m. John Street, Adelphi, London.

**Mar. 14.**—Oil and Colour Chemists' Association. "Solvents." Dr. Otto Jordan. 30 Russell Square, London, W.C.1.

**Mar. 14.**—Institute of Metals (London Section). "Failures in Service." Dr. H. J. Gough. 7.30 p.m. 83 Pall Mall, London.

**Mar. 14.**—Mineralogical Society. General meeting. 5.30 p.m. Burlington House, Piccadilly, London.

**Mar. 15.**—Society of Chemical Industry (Chemical Engineering Group and Plastics Group). "Plastics in a Chemical Works." M. B. Donald. 8 p.m. Burlington House, Piccadilly, London.

### BIRMINGHAM

**Mar. 12.**—Society of Chemical Industry (Birmingham and Midland Section). "Laboratory Testing of Lubricants and their Relation to Engine Tests." F. J. Slee. 7.30 p.m. University Building, Edmund Street, Birmingham.

### CARDIFF

**Mar. 14.**—Society of Chemical Industry (South Wales Section). Joint meeting with the Institute of Chemistry. "Modern Developments in the Distillation of Tar and Mineral Oils." W. Sanson. 7.15 p.m. Technical College, Cardiff.

### EDINBURGH

**Mar. 12.**—Society of Chemical Industry, Institute of Chemistry (Edinburgh Sections). "The Chemist and the Community." W. M. Ames. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

### GLASGOW

**Mar. 11.**—Institute of Metals (Scottish Section). "Welding." Dr. J. H. Paterson. Annual general meeting. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

**Mar. 15.**—Chemical Society, Institute of Chemistry, and Society of Chemical Industry (Glasgow Sections). "From Governor Phillip to d-neoisoMenthol: the Story of a Research, 1788-1934." Professor John Read. 7.30 p.m. Royal Technical College, Glasgow.

### HUDDERSFIELD

**Mar. 13.**—Institute of Chemistry (Huddersfield Section). Annual general meeting. Show of Educational Films. Huddersfield.

### LANCASTER

**Mar. 15.**—Lancastrian Frankland Society. "Industrial Fumes." W. A. Damon. 8 p.m. Storey Institute, Lancaster.

### LINCOLN

**Mar. 15.**—Institute of Fuel (East Midland Section). "The Modern Diesel Engine and its Development." W. A. Tookey. 7.30 p.m. Technical College, Lincoln.

### LIVERPOOL

**Mar. 14.**—Institute of Chemistry (Liverpool Section). "Natural Colouring Matters." Dr. J. D. A. Johnson. 7.30 p.m. Constitutional Club, India Building, Water Street, Liverpool.

### MANCHESTER

**Mar. 15.**—Society of Dyers and Colourists (Manchester Section). "Some Aspects of the Oxidation of Cellulose." H. A. Turner. 7 p.m. 36 George Street, Manchester.

### NEWCASTLE-ON-TYNE.

**Mar. 12.**—Institute of Metals (N.E. Coast Section). Discussion of Institute of Metals Paper No. 673: "The Improvement of White Bearing Metals for Severe Service." D. J. Macnaughtan. 7.30 p.m. Armstrong College, Newcastle-on-Tyne.

### NOTTINGHAM

**Mar. 14.**—Society of Chemical Industry (Nottingham Section). Jubilee Memorial Lecture. "In Quest of Colour." C. J. T. Cronshaw. 7.30 p.m. University College, Nottingham.

### SHEFFIELD

**Mar. 15.**—Chemical Society. "The Simplest Free Radicals." Professor F. Paneth. 5.30 p.m. University, Sheffield.

### STOKE-ON-TRENT

**Mar. 11.**—Ceramic Society (Pottery Section). "Saggars." N. P. Holcroft. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

### SWANSEA

**Mar. 12.**—Institute of Metals (Swansea Section). Annual general meeting. "Some Recent Developments in the Hardening of Non-Ferrous Metals by Heat-Treatment." W. T. Griffiths. 6.15 p.m. Y.M.C.A., Swansea.

**Mar. 16.**—Swansea Technical College Metallurgical Society. "Tinplate in High-Speed Can Production." G. C. Clark. 6.45 p.m. Technical College, Swansea.

### WORKINGTON

**Mar. 15.**—West Cumberland Society of Chemists and Engineers. "The Structure of Atoms and Molecules." H. Riley. 7 p.m. Workington.

# From Week to Week

BOOTS PURE DRUG CO. has placed a contract for the construction of a new £550,000 factory adjoining the "all-glass" factory opened at Beeston, Nottingham, in 1933.

TIN PRODUCTION IN CORNWALL has risen from 790 tons to about 2,000 tons, said Mr. Ernest Brown, Secretary for Mines, speaking in Cornwall on February 27, and Cornish mines not in operation in 1931 are now working.

SIR ARTHUR H. MARSHALL, chairman of the Alpha Cement Co., announced at the annual meeting on March 1, that the board intends to liquidate the subsidiary companies, and to merge their assets and liabilities with those of the parent company.

THE VICE-CHANCELLOR OF CAMBRIDGE UNIVERSITY has announced that he has received a letter from the Department of Scientific and Industrial Research offering to the University £2,300 for the building and equipping of the extension of the Low Temperature Research Station.

THE SECOND ANGLO-SCOTTISH BEET SUGAR CORPORATION has decided to operate the Cupar factory during the next campaign in spite of the heavy losses involved in bearing the burden of the development charges while operating the factory. The terms will be 36s. per ton, free on rail, and the acreage offered will be 7,835.

THE "NEW YORK TIMES," commenting upon the forthcoming international copper conference in New York, says that little difficulty in reaching an agreement is expected, all details regarding curtailment of production having been arranged informally at meetings in New York and London during the past few months. The paper adds that the limiting of the sales of U.S. copper abroad is expected to form one of the leading topics at the conference.

ON THE RECOMMENDATION of the Import Duties Advisory Committee, Orders authorising, as from March 11, schemes of drawback under Section 9 of the Finance Act, 1932, have been issued, in respect of nitro-cellulose photographic film base in rolls, used in the manufacture of unexposed sensitised photographic film, and in respect of unrefined fish and marine animal oils (other than cod liver oil and whale oil) and sperm oil used in the manufacture of the refined oils.

THE BUELL COMBUSTION CO., LTD., has secured a large contract for drying desiccated coconut. The contract, which has been placed by the Blue Bar Coconut Co., Ltd., Laguna, Philippine Island, consists of three Allen-Buell (Büttner system), vertical turbo dryers. Each dryer will be capable of dealing with 17 tons of wet material every twenty-four hours. Among other contracts recently secured are extensions to drying plants at the Lincolnshire Beet Sugar Co.'s factory at Bardney, and the Second Lincolnshire Beet Sugar Co.'s factory at Brigg. An Allen-Buell (Büttner system) vertical turbo dryer is being supplied to the British Glue and Chemical Co., Ltd., for dealing with digested bones.

A COLOUR CARD of the new Scarlet Chrome 17233 has been issued by Imperial Chemical Industries, Ltd. The four products known as primrose chrome, lemon chrome, middle chrome and orange chrome have long been valued by colour users in view of their cheapness and high covering power. Scarlet chrome is the latest addition to this range. It represents an entirely new departure in chrome manufacture in the United Kingdom, for its shade is equal in brilliance to those previously only obtainable by the use of the more exclusive lake colours, and it lacks none of those properties peculiar to ordinary chromes, that is to say, exceptional covering power and economical working.

NEGOTIATIONS to terminate the dispute in the salt industry took place at Liverpool on February 25, when members of the Salt Manufacturers' Association met representatives of the men's union. The following offer was made to the men's representatives: "As soon as your officials can show undertakings signed by all the twelve manufacturers not within the association that they will pay the same rates and give the same conditions and advantages (including holiday with pay) as do the other manufacturers, then the association members will restore the 1931 cuts, subject to all outside manufacturers agreeing in writing to do the same." The union delegates are taking the instructions of the executive on the offer.

THE OXLEY ENGINEERING CO., LTD., has been given contracts for the following plant, all of which is to be electrically welded throughout. Supplying and erecting a spiral guided gasholder, 80,000 cu. ft. capacity, in steel tank. The sides of the lifts, and rollers and carriages, will be constructed on the "Hollis" patented system. This will be the largest all-welded gasholder in this country. The firm has recently completed the erection of an all-welded column-guided gasholder for Imperial Chemical Industries, Ltd., at Billingham, and is now completing the erecting of an all-welded column-guided gasholder in Wales, which has many interesting features, such as an inner tank, automatic cut-off and by-pass to the inlet and automatic cut-off to the outlet, and distance control indicator. An order has been received for completely re-sheeting two lifts of a 105,000 cu. ft. gasholder, the whole of the sheets being electrically welded. In addition the firm has contracts for electrically-welded storage tanks in various parts of the country.

AN EARLY INDUSTRIAL DEVELOPMENT is likely in the vicinity of Tadcaster, where a firm of paper manufacturers contemplates the erection of a factory. The new factory will probably find work for about 100 persons at the start.

A 60FT. MILL CHIMNEY collapsed at Batley on March 3. The chimney, which was one of the oldest in the town, was built over 100 years ago. It was a square stone structure attached to the works of Walfox, Ltd., manufacturing chemists, of Clerk Green.

GLASS which so diffuses the light that it casts no shadow is now being produced in England. Thermolux, as this new product will be called, consists of two pieces of plate glass with a thin layer of glass-silk between. The latter is the diffusing agent.

THE LAUTARO NITRATE CO. announces that the adjourned general meeting will be held at Valparaiso, Chile, on March 22. The report for the year to June 30 last will shortly be available, and will be issued to shareholders not later than seven days prior to the meeting date.

LANARK COUNTY COUNCIL is considering a scheme to establish a factory at Uddingston, for the production of domestic chemicals. The factory will be at the County Council gasworks and it is expected that more than fifty men will be employed. Sulphate of ammonia will be the principal manufacture.

A BONUS of ½d. an hour is to be given to workers in the cement industry. An official statement issued by the National Joint Industrial Council for the Cement Industry says that the bonus will operate from the first full pay week in March, subject to the further consideration of the position in South Wales.

THE EAST END TRADESMEN'S ASSOCIATION, of which Mr. Lloyd Willey, of Thomas Hill-Jones, Ltd., is president, held its 57th annual dinner and ball on February 28, at Hamilton Hall, Abercorn Rooms, Liverpool Street, in aid of the London Hospital. Over £500 was collected, and over 200 people were present. Sir William Goschen was in the chair.

THE NATIONAL WINDING AND GENERAL ENGINEERS' SOCIETY, which has about 2,500 members employed at the Billingham works of Imperial Chemical Industries, Ltd., has set up a "trades union medical bureau." Under the scheme, local members are already subscribing 2d. per week towards the cost of the service. Objects of the bureau are: (1) Supervision and periodical examination of all members; (2) to collect data regarding the effects of industry on members with a view to scheduling harmful industries as compensatory, and to protect members from dismissal on health grounds arising from industrial conditions; (3) centralisation of all compensation work.

THE GOVERNMENT OF INDIA reports that two separate agreements have been negotiated with Imperial Chemical Industries, Ltd., in connection with the company's proposal to erect an alkali factory. One with the Punjab Government dealt with the supply of lime stone, and the other with the Government of India referred to the supplies of waste salt, brine and other products in the Khewra salt mines. The agreement with the Government of India provided for a five-year option to the company to take up a fifty-year concession for the exclusive right to obtain the salty material in question, for use in a factory, subject to the safeguarding interests of the Government of India, and of those concerns already established and which were engaged in the production of refined table salt.

INTERNATIONAL COMBUSTION, LTD., Grinding, Screening and Filtering Division, report recent orders for England covering 7 ft. by 48 in. and 8 ft. by 48 in. Hardinge ball mills for grinding frit; "A" and "B" size I.C. grinders for grinding scrap jointing and gramophone record material respectively; a No. 0 Raymond pulveriser body being part machine to deal with hydrated lime; 4 ft. by 8 ft., type 400, Hummer electric screen to screen ground gypsum; 3 ft. 6 in. dia. Andrews deslimer to recover clean, washed gravel; 2 in. X rubber-lined grit pump to deal with whiting. Orders for abroad include a 7 ft. by 36 in. Hardinge ball mill to grind medium hard tin ore; 3 ft. by 8 in. Harding ball mill for grinding gold ore; two No. 70 Raymond "Impax" pulverisers for grinding wankie coal; 2 in. rubber-lined grit pump for dealing with calcined flint; and Ro-Tap testing sieve shakers for testing purposes.

TWO MEN WERE KILLED and members of a rescue party were affected by fumes in a mishap at the Sheppey Glue and Chemical Works, Queenborough, on March 5. The two men who lost their lives were Wallace Holmes, foreman, and Frederick Ost. Ost was cleaning the iodine tank in the still room at the works, and it is thought that he must have been overcome by the fumes and collapsed in the tank. Not hearing anyone about, the foreman made inquiries and it is presumed that he also was overcome by the fumes. The alarm was raised by the yard boy, and Ost was found lying at the bottom of the tank, with one leg through a ladder leading to the still room. Holmes was huddled on the top of him. William Rule, the yard foreman, managed to drag out the two men, and himself collapsed until restored by oxygen. Artificial respiration was tried but both men were dead. An official statement said that the two men fell into a tank containing sulphur liquor after neutralisation of iodine liquor.

## Company News

**British Oil and Cake Mills.**—A final dividend of 7½ per cent. is announced, making 12½ per cent. for the year.

**Tehidy Minerals.**—For the year to December 31 last, the report shows a profit of £11,524, against £9,083 in the previous year; to this is added, brought forward, £7,203, making £18,728. A final dividend of 6d. per share, less tax, making 3¾ per cent. is paid, leaving £7,703 to be carried forward.

**Yorkshire Indigo, Scarlet and Colour Dyers.**—The report for the year to December 31, 1934, shows a profit, after depreciation, of £2,627. To this is added transfer from stock reserve, £1,000, transfer from claims reserve, £1,047, making £4,674; less interest on debenture stock, gross £4,514, deficiency brought forward £6,416, resulting in a deficiency forward £6,255.

**Staveley Coal and Iron Co.**—An interim dividend of 3 per cent., tax free, for the year ending June 30, is announced on the capital. This compares with 2½ per cent., tax free, paid during the previous few years. For the year 1931-2 and for 1932-3 the dividend was 5 per cent., tax free, out of profits of £372,292 and £404,819 respectively. In the last financial year there was a substantial improvement, to £468,973, in earnings, while the year's dividend, of 6½ per cent., tax free, is stated to be the highest since that for 1926-7.

**English China Clays.**—The report for the year ended December 31, 1934, of English China Clays, which holds 60.21 per cent. of preference and 62.98 per cent. of ordinary shares in English Clays, Lovering Pochin and Co., shows total dividends received or receivable £35,645; to this is added rents and interest and after deducting expenses, there is a profit of £38,296, with the amount brought forward, £6,583, there is a total of £44,879. From this is deducted dividends on preference shares for six months to December 31, 1932, paid during year (gross) £13,967, income-tax (balance) £1,751; payment of arrears of dividend on preference shares for year ended December 31, 1933 (net) £21,649, leaving to be carried forward, £7,511.

**Evans Sons Lescher and Webb.**—The report for the year to December 31, 1934, states that an arrangement has been made under which, subject to payment of £10,000 by February, 1936, the balance of credit notes issued to bankers outstanding—£44,393—is extended for a further period, and is repayable in ten annual instalments of £4,439, of above £10,000, the sum of £5,000 was paid in October last, and the rate of interest reduced from 5 per cent. to 4½ per cent. The trading profit, after advertising and provision for bad and doubtful debts, and depreciation, was £45,111, against £32,696 in the previous year, less mortgage interest, tax, etc., leaving £31,070. To this is added, brought forward, £3,039, making £34,110. Provision for mortgage and leasehold redemption account absorbs £1,579, interest on credit notes, £2,597; transfer to general reserve, £15,000; payment of a year's dividend on 6 per cent. preference shares, £11,243, leaving to be carried forward £3,689.

## New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to March 20, 1935.

**Setilon.** 556,111. Class 1. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. H. Th. Bohme Aktiengesellschaft, 29 Moritzstrasse, Chemnitz, Saxony, Germany. December 4, 1934.

**Deoxylyte.** 556,570. Class 1. Chemical substances used in manufactures photography or philosophical research, and anti-corrosives. Nobel Chemical Finishes, Ltd., Imperial Chemical House, Millbank, London, S.W.1. December 19, 1934.

Opposition to the registration of the following trade marks may be lodged up to March 27, 1935.

**Wischu.** 557,472. Class 1. Chemical substances for steeping colouring and brightening textile fabrics and leather in the course of their manufacture. H. Th. Bohme A.G., 29 Moritzstrasse, Chemnitz, Saxony, Germany. January 26, 1935.

**Piodent.** 557,572. Class 4. Raw or partly prepared, vegetable, animal, and mineral substances used in manufacturers. Casebourne and Co. (1926), Imperial Chemical House, Millbank, London, S.W.1. January 30, 1935.

## Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**Cyprus.**—A firm of manufacturers' agents in Nicosia desire to secure the agencies of United Kingdom manufacturers of pharmaceutical preparations (proprietary lines and quinine), either on a commission or purchasing basis. (Ref. No. 203.)

**New Zealand.**—A firm of rubber merchants and importers recently established in Auckland (New Zealand) desires to secure the agencies of United Kingdom manufacturers of all classes of rubber manufactures. (Ref. No. 208.)

**Holland.**—An agent established at Bussum wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of power station, gasworks and chemical engineering equipment. (Ref. No. 215.)

**Siam.**—H.M. Consul-General at Bangkok reports that the Royal State Railways of Siam is calling for tenders (Tender No. P.271-3/5/35), to be presented in Siam by May 3, 1935, for the supply of 250 kegs of white lead paint. (Ref. B.Y. 7989.)

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The Committee will in July allocate a limited number of Grants-in-Aid to young men and women employed in chemical works in, or near, London, who desire to extend their education for a career in chemical industry. Applicants must not be under 17 years of age. Applications, with particulars of age, nature of employment and the manner in which the grant would be used, and giving the name of some person to whom reference may be made, should be sent as soon as possible, and in any case not later than May 1st, 1935, to the Director of the Institute, Salters' Hall, St. Swithin's Lane, London, E.C.4.

ARTHUR SMITHELLS,
Director.

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Applications are invited for a limited number of Fellowships available for chemists of post-graduate standing. The object of the Fellowships is to afford additional and special training at home or abroad preparatory to a career in industrial chemistry. The course to be followed will in each case be decided by the Director in consultation with the Fellow. The value of a Fellowship is normally from £250 to £300, but the Institute is prepared to consider applications which might justify the award of Fellowships of higher value.

Applications should be received by the Director of the Institute, Salters' Hall, St. Swithin's Lane, London, E.C.4, on or before

1st MAY, 1935.

Further particulars and forms of application may be had on request.

ARTHUR SMITHELLS,
Director.

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**PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO. (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London. W.C.2. Telephone: Holborn 1525. Established 1905.**

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PATENTS and DESIGNS ACTS, 1907 to 1932.—NOTICE IS HEREBY GIVEN that NORTH BRITISH RAYON, Limited, of 6 Clement's Inn, London, W.C.2, and ALBERT VINCENT PITTER, of Bongate Villa, Jedburgh, Roxburgh, seek LEAVE to AMEND the SPECIFICATION of the application for Letters Patent No. 419,477 for an invention entitled "IMPROVEMENTS IN OR RELATING TO THE MANUFACTURE OF ARTIFICIAL SILK THREADS, FILAMENTS AND THE LIKE." Particulars of the proposed amendment were set forth in No. 2,406 of the Official Journal (Patents), published on February 27th, 1935. Any person, or persons may give notice of opposition to the amendment by leaving Patents Form No. 19 at the Patent Office, 25 Southampton Buildings, London, W.C.2, within one calendar month from the date of publication of the said journal.—M. F. LINDLEY, Comptroller-General.